MARCH 29, 1945

American Machinist

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Recommended Grinding Practice For Round and Concentric Holes

•

Spline Gages Hold Close Tolerances

•

Machining Glass-Reinforced Plastic With Tungsten-Carbide Tools

•

Production Trouble-Shooting on the B-29

Magnetic-Particle Testing

WHERE IT STANDS AS A PRODUCTION TOOL

Ample capacity is provided for this aircraft housing on a HEALD No. 174 Gap Internal. Use of raising blocks increases swing capacity to 50" inside the water guard.
HEALD RED HEAD
A HEALD No. 81 internal grinds the 1/8" bore in hardened steel ball bearing inner races. Tolerances held within .0004"—production increased 400 per cent.

Swing CAN'T STUMP PRECISIONEERING!

Aircraft housings that call for a 50" full swing; ball bearing races ¼" O. D., with a ⅛" diameter bore—it's all the same to precisioneering!

The size of a part is no problem on a Heald Internal Grinding Machine—custom-tailored for the job. It can be engineered to meet your specific needs for closest tolerances with high volume production. 250 precisioneers at precision headquarters—backed up as they are with long experience in *your* industry—will see to that!

If it's a job of internal or surface grinding; boring, turning, facing, chamfering or grooving that demands utmost-precision and a fast production pace—HEALD has the answer.

And if you're a hard man to convince, so much the better! Come up to precision headquarters and see for yourself—or call in your local Heald man to prove to you that we can give you *more precision faster.* You'll be glad you did!

THE HEALD MACHINE COMPANY
WORCESTER 6, MASS.

HEALD

means more precision faster!

INTERNAL AND SURFACE GRINDING MACHINES
BORE-MATIC PRECISION FINISHING MACHINES

American Machinist

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MAJOR ARTICLES

Machining Glass-Reinforced Plastic.....*Harry Crump* 91
Advance Termination Work Clears Large Plant in 28 Days..... 94
Hirohito's Helpers..... 96
Milling Cutters and How to Use Them.....*M. Martellotti* 98
Portable Hydraulic Unit Checks Bomb Lug Welds..... 101
Recommended Grinding Practice for Holes.....*Stuart St. John* 102
Positioning of Large Punch Press Dies.....*K. B. Jamison* 105
Gages Hold Close Tolerances....*B. P. Astley & A. S. McClenaghan* 106
Where Magnetic-Particle Testing Stands as an Inspection Tool.... 108
Trouble-Shooting Effective on B-29 Bombers....*Clyde L. Belden* 113
Output of Polishing and Buffing Machines.....*A. H. Losey* 115

PRACTICAL IDEAS

Radio Plugs Soldered on Machine.....*Anthony Zappia* 119
Top and Side Chipbreakers Ground.....*Kenneth Thurston* 120
Accurate Drilling by Grinding Chuck Jaws.....*Louis Eickhoff* 120
Deformed Welding Tips Reshaped.....*S. Sheffield* 120
Four-Station Lathe Carriage Stop.....*Donald R. Tryer* 120
Bevel Gear Backlash Determined.....*F. R. McFarland* 121
Special Star Gage for Bomb Bay Door Screw..*Ralph Hembrough* 123
Flame Cutting Free-Flowing Curves.....*Russell R. Ripley* 123
Additional Life for Cup-Shaped Grinding Wheels..*Emil Reinhardt* 123
Large Tubes Cut Uniformly.....*James F. Porter* 124
Outboard Bearing Provides an Arbor Support.....*C. J. Moltke* 124

NEWS OF THE INDUSTRY

Gaging Business 128a
Inside Detroit 128c
Wartime Washington 128e
Spotting the Air News 128f
Names in the News 128g
Obituaries 128h

DEPARTMENTS

Editorial 89
Reference Book Sheet 125
Shop Equipment News 129
Parts and Materials..... 142
Trade Publication 146
New Books..... 150

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American Machinist Chips

Colvin Cutter Comments . . . Fred Colvin, who needs no introduction to *American Machinist* readers, comments as follows on the milling articles by M. Martellotti, Research Engineer of Cincinnati Milling. (Series started August 17, 1944 issue of *American Machinist.*)

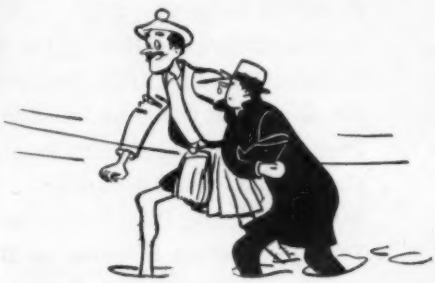
"These articles are both interesting and illuminating. Few of us realize the effect of the different factors involved on the work, the life of the cutters and power consumption. When we begin to study the varying effects of the cutting angle and the helix, for both 'in' and 'out' or 'down' and 'up' milling with slab milling cutters, we find more than we had imagined. Even greater surprises await us when we consider face milling . . . for here the corner angle becomes more important than we had realized.

"Another factor which is frequently overlooked is the relation between the axis of cutter and the surface of work it contacts in entering the cut. This relation has much to do with the point of contact between the cutting edge and the work. While negative rake is designed to bring this contact back of the point, or corner, it may not do so unless the contact surface is below the cutter axis."

Hargest In Kilts . . . Just received a chatty letter from Bill Hargest, *American Machinist's* war correspondent in London. Bill apologized for not sending any items for *Chips*, but you may be interested in the following personal notes:

"I have just returned from a trip to Scotland, where I visited a plant in an isolated region up North. It was necessary for me to reside in a farmhouse adjacent to the factory. The nearest village was 16 miles away. A few days prior to my arrival, a heavy snowfall plus drift made roads almost impassable. Therefore, I welcomed the chance to work in a factory and walk a hundred yards to my residence.

"Incidentally, while there, I spent several evenings with a chap chuck-full of Scottish lore and history. One evening he wanted me to walk six miles to visit a famous loch. Can you imagine me wading through snowdrifts and ice to see a frozen lake, in temperatures ranging from 5 to 10 degrees below zero? I much preferred to sit in front of a huge log fire and read about Bonnie



Prince Charlie and the Rebellion of '45. It really was something to read a book having descriptions of the area in which you happened to be at the moment.

"The next morning, the chap I was telling you about pointed out several of the locations mentioned in the book. Any moment I expected to see clansmen bedecked in riotous tartans dashing out of the wood, sniffing for 'the blood of an Englishman.' Being Welsh, I had nothing to fear. But who are these Scotch to distinguish between the Welsh and the British? Perhaps I should have worn a leek in my hair.

"On leaving London, I had a sleeper—by the luck of the Devil and the help of the War Transport Ministry. When I boarded the train, my compartment was like an icebox. Anticipating a refrigerated journey northwards, I dressed in two pairs of pajamas, a heavy woolen sweater, a field jacket, and a pair of bedsocks. During the night, the heat came on and I ended the journey in the nude.

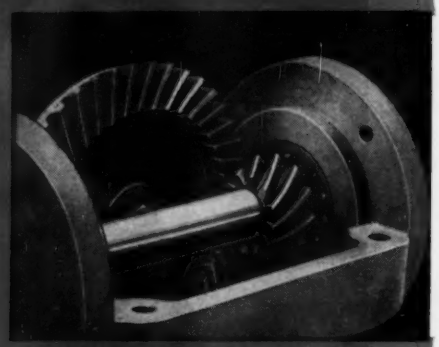
"The return trip to London was quite the reverse. I anticipated being too warm, but the car was cold and I arrived in London dressed for the Polar Regions. Even with these experiences, I was satisfied. The last trip North was made sitting up in a diner, after standing half the way. Boy, will I be glad to get back to roomettes, with plush upholstery and more than a china pot beneath the wash basin."

Shown below is a picture of Hargest (second from left) with a group of colleagues who traveled with him as he gathered material for his recent article on Mobile Training Units.

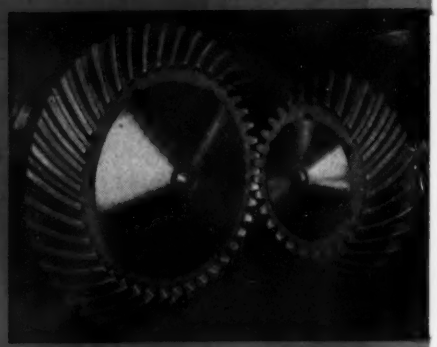
Magnesium Show . . . Groups of production, engineering and purchasing men may now have the benefit of an educational program on magnesium . . . through the Hills-McCanna Company, 3025 N. Western Avenue, Chicago.

The program consists of a sound film depicting the production and fabrication of magnesium, displays of various magnesium products, souvenirs, literature . . . in short, the works.

WHY GIVE BEVEL GEARS *A Running Test?*



Spiral bevel gears in final mountings showing actual tooth contact



Spiral bevel gears in Gleason Testing Machine showing desired tooth contact for proper operation of gears in final mountings

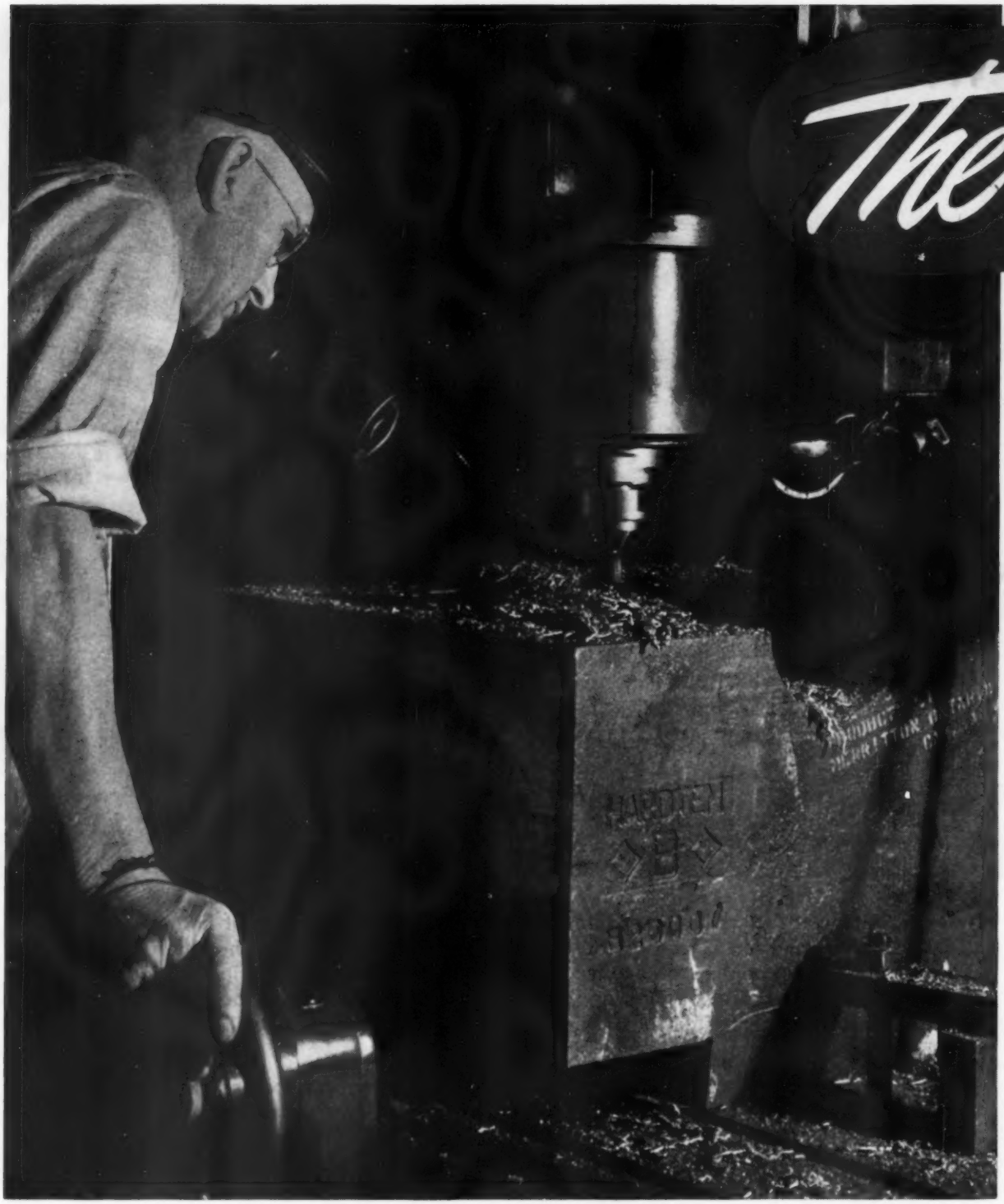
Bevel gear users must know how their gears will operate in their final mountings. Gleason testing machines provide a practical method of insuring that the gears are right before expensive assembly. In these testers the gears are rigidly mounted in the correct operating position and run under power and brake load. By means of machine adjustments it is possible to determine how the gears will operate in and out of position in their final mountings.

Tooth size, pronounced run-out and tooth spacing error, smoothness and quietness of operation, and actual tooth contact under load (known as tooth bearing) are all checked by the running test. This test is important for all types of gears, but it is essential for the tapered teeth of bevel gears, which can not be checked for shape in any other practical manner.

In all stages of gear manufacture the running test gives a positive indication of how the gears will operate in their final mountings. This check is invaluable:

Before Production — to determine correct set-up of gear cutting machine.
During Production — to maintain uniform quality of the production gears.
Final Test — to find the best running position of the gears for assembly.
— to eliminate "fitting" or "tearing down" and rebuilding of an assembly, because the gears are not right. Substantial savings in time and expense result.

Send in prints of your gears to the Gleason Works. We will be glad to recommend the testing machine best suited to your needs. The Gleason Works, Rochester 3, New York, U. S. A.



CINCINNATI *Vertical Hydro-Tel Milling Machine, arranged with Automatic Depth Control Attachment, mills the cavities in a heavy steel die. The time saving on a variety of work performed on many Hydro-Tel Millers averages 40%.*

CINCINNATI

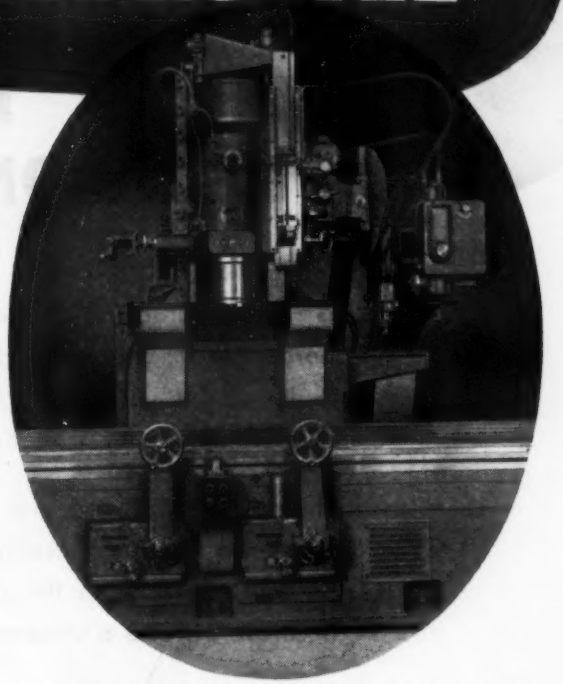
Keep on buying WAR BONDS

THE CINCINNATI M

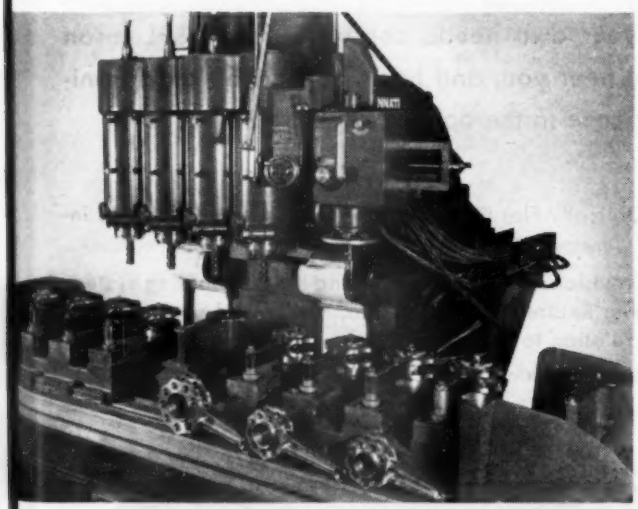
MILLING MACHINES

Versatile CINCINNATI HYDRO-TEL

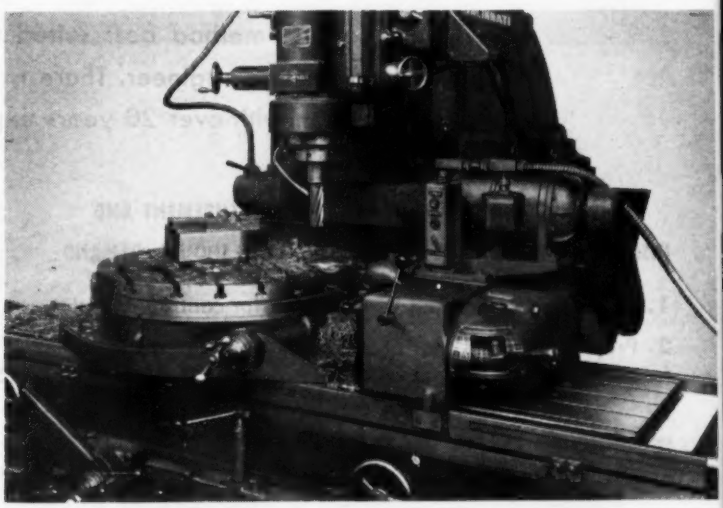
● To begin with, standard Hydro-Tels have the capacity to handle an unusually wide range of milling. Then there are three basic deviations from standard machines: 1) Hydraulic Automatic Depth Control for die sinking; 2) Selective 360° Automatic Profiling for automatically milling profiles from a master template, with arrangement to by-pass the profiling unit; 3) Non-Selective 360° Automatic Profiling for automatically milling profiles from a master template. The three illustrations on these pages give you an idea of how CINCINNATI 28″ series Vertical Hydro-Tels may be equipped for specific types of milling operations, thus converting them from general purpose millers to special or semi-special production machines. ¶ Perhaps some of your jobs could be handled more efficiently and economically on a CINCINNATI Hydro-Tel Milling Machine. Our engineers will be glad to talk it over with you and give you the benefit of many years' experience.



28″ Series CINCINNATI *Vertical Hydro-Tel Milling Machine. Available in three table travels, 60″, 96″ and 120″. Catalog M-1284 contains complete specifications.*



Here four parts are automatically milled each cycle. The machine is a CINCINNATI *28-72 Vertical Hydro-Tel equipped with a Four-Spindle Head and a 360° Automatic Profiling Attachment. Duplicate fixtures eliminate idle time loading and unloading.*



This Hydro-Tel is equipped with a 36″ Power Driven Circular Milling Attachment. Through the movement of a single lever, the feed change unit at right provides 16 changes of feed. Completely self-contained, the equipment on this machine may be removed whenever desired.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

80% time saved...

INSPECTING HIGH PRECISION COLLET HOLDERS

The manufacturer of these collet holders reports "a time saving of eighty percent (80%) over the method formerly used - - - ", when a Jones & Lamson Pedestal Optical Comparator was installed. The angles are held to limits of ± 15 minutes of arc, and the straight diameter to ± .001".

Through a highly precise lens system, a magnified shadow of the part is projected upon the screen of the Comparator and compared with a master outline drawn upon the glass. It's as simple as that, and the results are accurate beyond a shadow of a doubt.

Form tools, gages and other products with complex or multiform contours can be checked and measured in all dimensions by means of the standard measuring attachments of Jones & Lamson Optical Comparators.

For the method best suited to your own needs, consult a Jones & Lamson inspection engineer. There is one near you, and he is backed by an organization with over 20 years experience in the optical inspection field.

WHEN PURCHASING EQUIPMENT FOR MEASUREMENT AND INSPECTION BY OPTICAL PROJECTION, YOU SHOULD DEMAND:

1. Precision Condensing Lens System for controlling light.

2. Projection lenses that project a sharply defined image, free from distortion and color, *anywhere on the screen.*

3. Optically Flat Reflection Mirrors *sufficiently thick* to insure *permanent* flatness.

4. Provision for positively aligning the illuminating system, staging fixtures, projection lens, mirror and screen in correct relation to each other.

5. Rigid Machine Construction.

This book "Beyond a Shadow of a Doubt" will tell you more about our Optical Comparators and what they are doing.

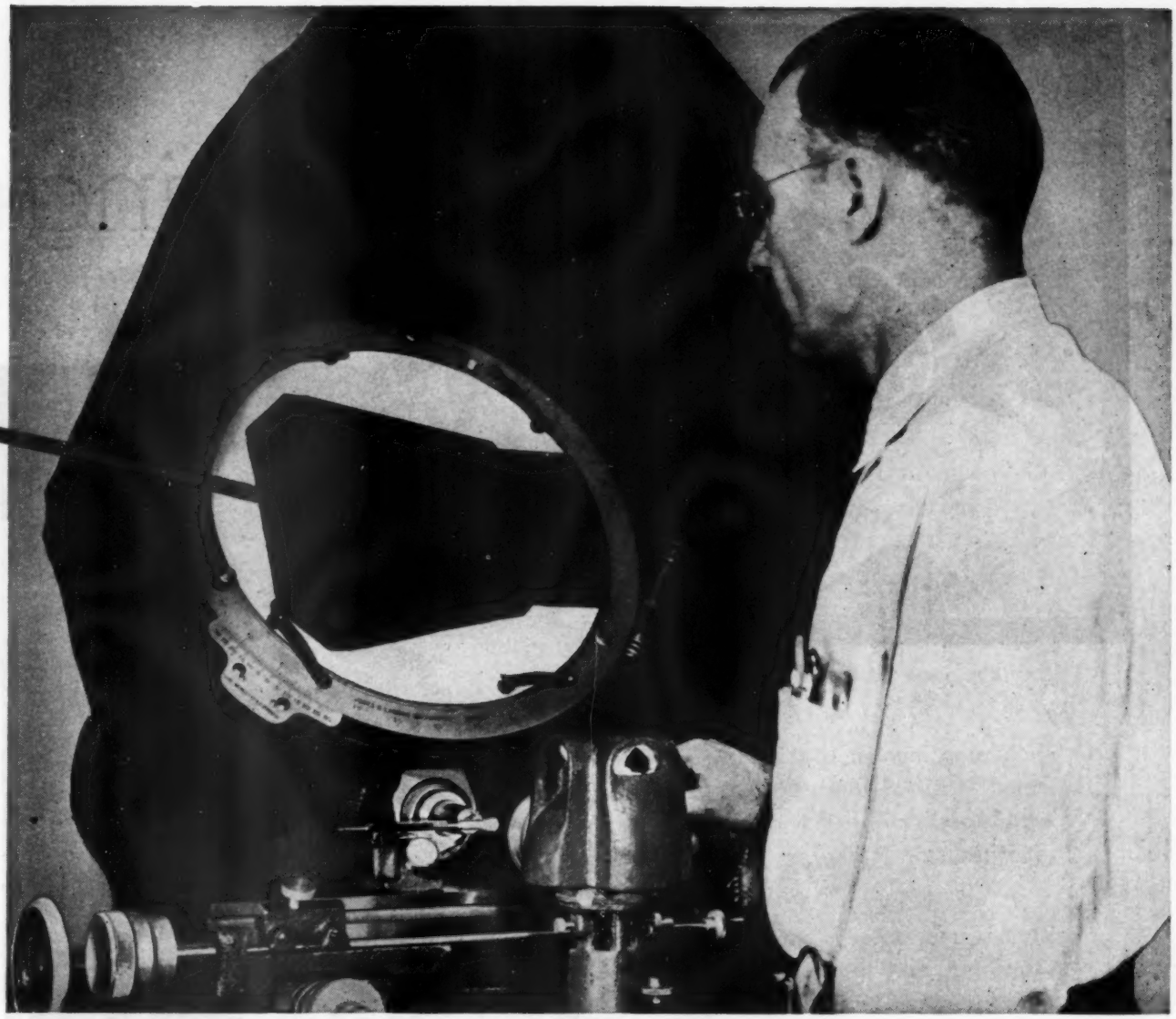


Photo courtesy The Arc Equipment Corporation, Bryan, Ohio

JONES & LAMSON

MACHINE COMPANY

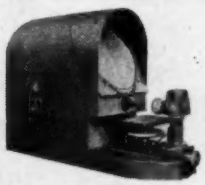
SPRINGFIELD, VERMONT, U. S. A.

OPTICAL COMPARATORS

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

BENCH COMPARATOR WITH 14" DIAM. SCREEN & MEASURING ATTACHMENTS

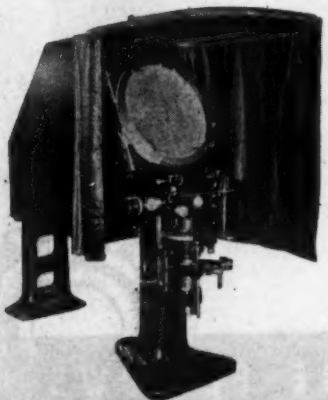
STANDARD BENCH COMPARATOR



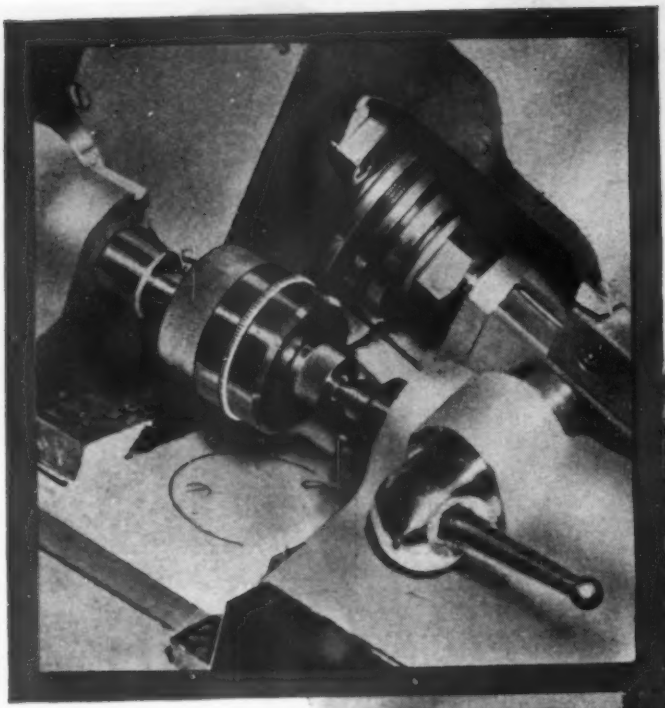
BENCH COMPARATOR 14" DIAM. SCREEN

DIRECT PROJECTION COMPARATOR

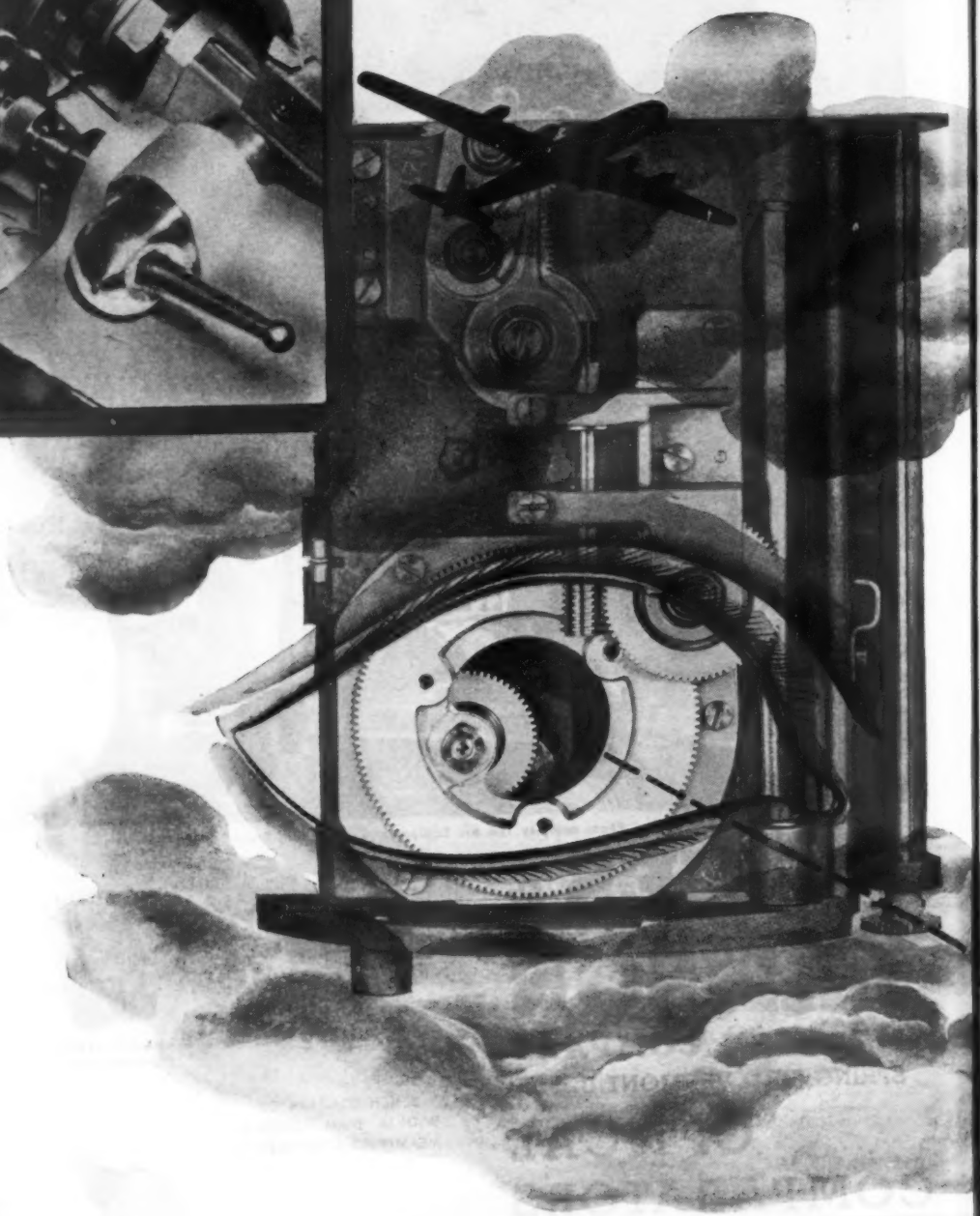
STANDARD PEDESTAL COMPARATOR



PEDESTAL COMPARATOR 22" — 30" DIAM. SCREENS



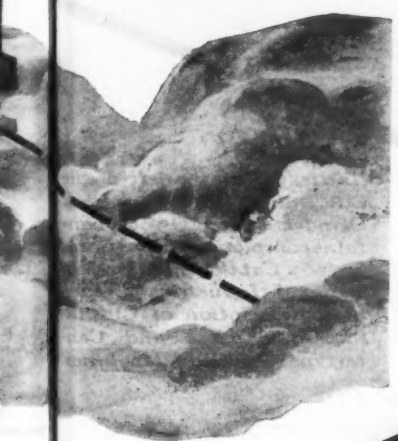
Shaving



THE FELLOWS METHOD...MACHINES AND TOOLS FOR

HELPS LOCATE THE HIDDEN TARGET

Some of the wonders of science are revealed in the instruments now available, which enable our airplane pilots "flying blind" to hit the hidden target "on the nose".



These "automatic brains" of modern aeronautical science perform their task unfailingly, because developments similar to the Fellows No. 4 Fine-Pitch Gear Shaving Machine turn out gears of "instrument" quality as an everyday performance. Fellows machines and tools hold gears to limits of "two-tenths" and produce "no-backlash" gears when critical specifications demand.

A typical performance is the 80 pitch aluminum gear illustrated, 1.8125" pitch diameter—preshaved to .001" tolerance, and finished on the Fellows No. 4 Fine-Pitch Gear Shaving Machine to limits of +.0002" —.0003". Shaving time, 40 seconds.

We are not permitted to state how many gears and pinions comprise this unit. The important point is that their aggregate accuracy, through Fellows Shaving, contribute largely to the uncanny readings upon which the accuracy of this instrument depends.

For bulletin describing the Fellows No. 4 Fine-Pitch Gear Shaving Machine, write: The Fellows Gear Shaper Company, Springfield, Vermont, U.S.A.—640 West Town Office Building, Chicago 12, Illinois —616 Fisher Building, Detroit 2, Michigan.

Shaving tools for 24 to 100 pitch gears and pinions are available for use on this Fellows No. 4 Fine-Pitch Gear Shaving Machine. It assures super accuracy combined with high production.

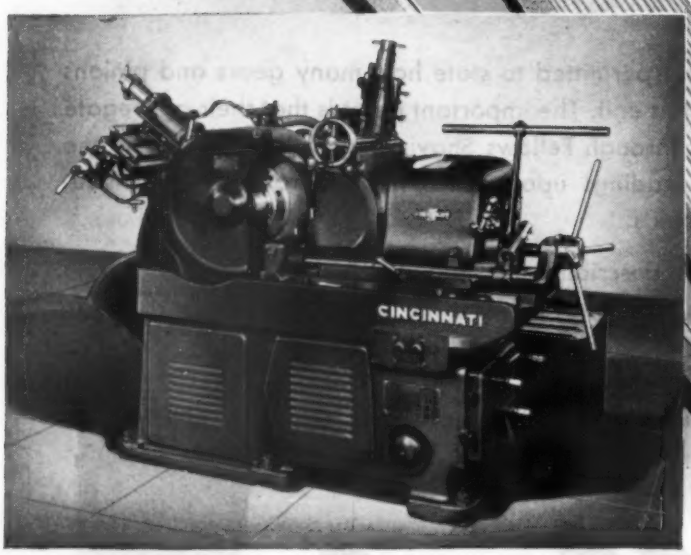
Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

CINCINNATI

MEMORANDUM

Check this! Family of Four Parts Ground on a Cincinnati Centerless in one Set-up



Illustrated at the left is the CINCINNATI *No. 2 Centerless Grinder. Catalog G-456-3 contains complete specifications. Sweet's Catalog File for Mechanical Industries gives a brief description of* CINCINNATI *Centerless and Centertype Grinding Machines.*

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES

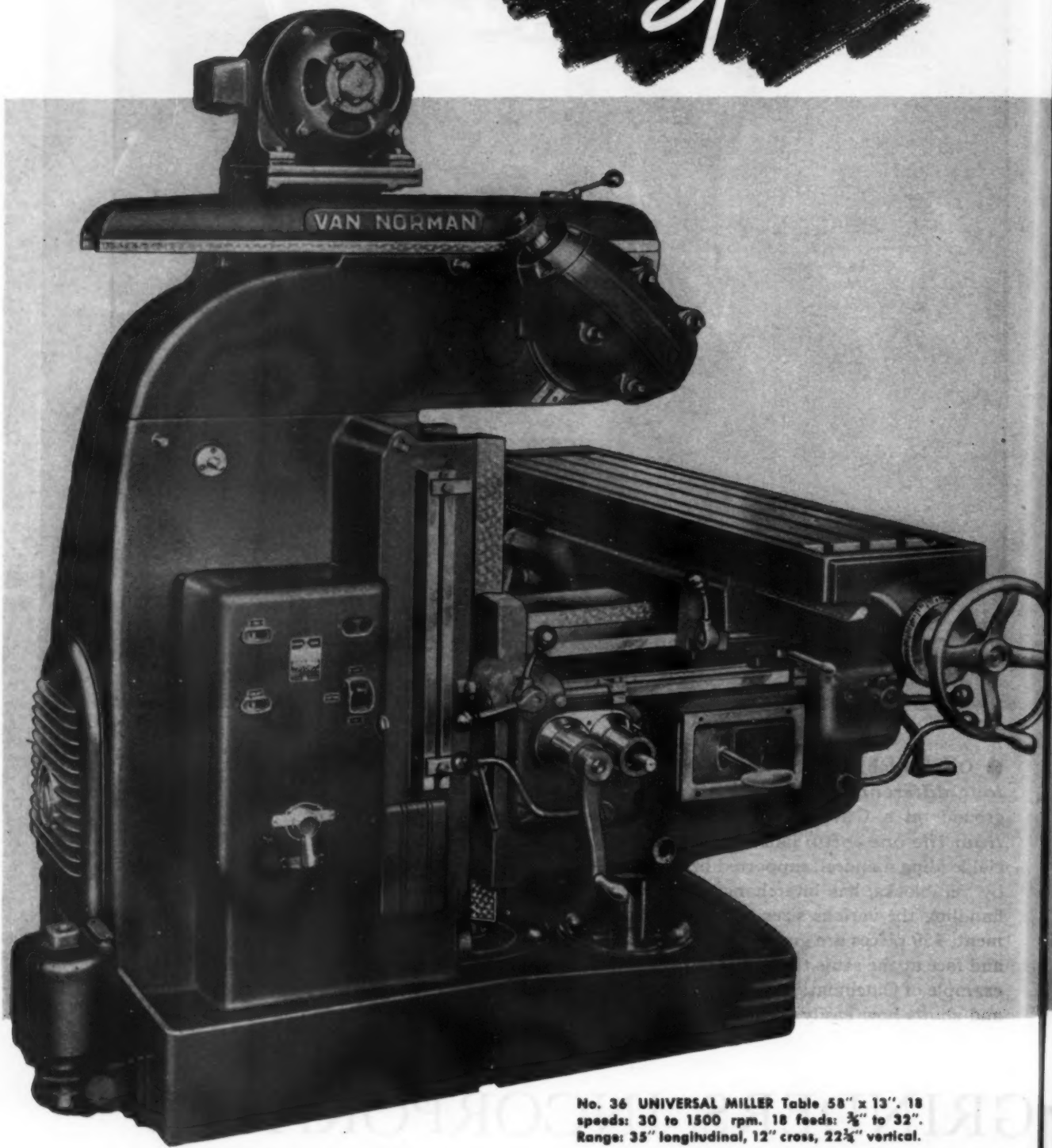
● On this job, the pilot diameter and face of *four different sizes* of flanged buttons are ground on a CINCINNATI No. 2 Centerless *from the one setup* illustrated above. A special loading mandrel, supported between wheels by vee blocks, has interchangeable details for handling the various sizes. With this arrangement, 150 pieces are ground per hour, diameter and face at the same time. The setup is another example of Cincinnati Application Engineering, and shows how easily CINCINNATI Centerless Grinders may be tooled up for a family of parts. These machines are built in three standard sizes (and larger and smaller than standard, too) for handling a wide range of cylindrical and spherical parts in virtually all types of metal and metal substitutes. Why not talk over your grinding operations with our engineers? They will be glad to give you the benefit of more than a score of years' experience in the application of the centerless method to difficult and unusual grinding jobs.

GRINDERS INCORPORATED

CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

NO OPERATOR "Dead Spots" IN



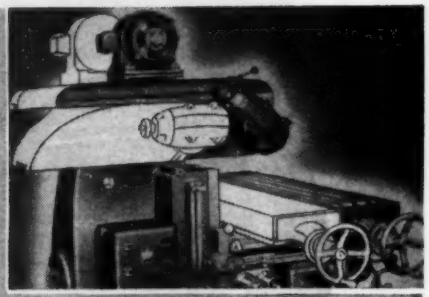
No. 36 UNIVERSAL MILLER Table 58" x 13". 18 speeds: 30 to 1500 rpm. 18 feeds: ⅜" to 32". Range: 35" longitudinal, 12" cross, 22½" vertical.

VAN NORMAN RAM-TYPE UNIVERSAL MILLERS

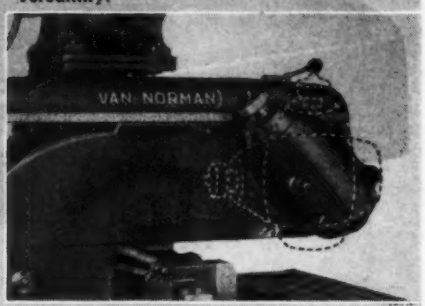
1 Front and Rear operation of *manual* and *power* feed controls

2 Adjustable cutterhead gives vertical, horizontal and angular milling

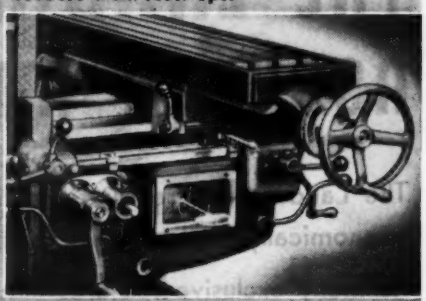
3 Movable Ram provides increased work capacity



Adjustable cutterhead and movable ram in combination with the saddle cross feed provides maximum milling capacity and versatility.



Adjustable cutterhead permits vertical . . . horizontal . . . or angular milling all on one machine—gives you the work range of several types of millers . . . greatly reduces work reset-ups.



Front and Rear control of both hand and power feeds gives operator complete control of milling operations from either location.

Whether the operator is at the front or rear of the machine, he always has complete control of a job on Van Norman Ram-type Millers. Why? Because all feed controls—manual or power—are located in both the front and rear of the machine. This means that there is no more running from front to back or vice versa to line up work for the cut. It means complete visibility of the cutting operation no matter in what position the operator stands. Result—no back and forth steps . . . minimum worker fatigue . . . and most important, accurate work with minimum rejects.

In addition to "complete control of the situation", Van Norman Universal Millers have an adjustable cutterhead that permits vertical, horizontal or angular milling on one machine, permitting operators to complete most jobs without work reset-ups.

Other Van Norman features such as movable ram, single feed and speed selectors, front and rear directional control of all power feeds, extra heavy-duty construction of ram, column, table and knee assemblies—all assure increased accuracy, simplicity of operation and ease of maintenance. Write for information.

VAN NORMAN COMPANY

SPRINGFIELD 7, MASSACHUSETTS

"It pays to Van Normanize"

VAN NORMAN MACHINE TOOL COMPANY

SPRINGFIELD, MASSACHUSETTS

THE LANDMACO THREADING MACHINE ASSURES MINIMUM OPERATING COSTS

The Landmaco Threading Machine is a precision tool capable of handling your threading operations economically. It is geared for high threading speeds with resultant maximum production.

Its many exclusive features assure the greatest possible degree of accuracy, ease of operation and flexibility in making set-up changes.

Write for Bulletin No. H-75

LANDIS MACHINE COMPANY

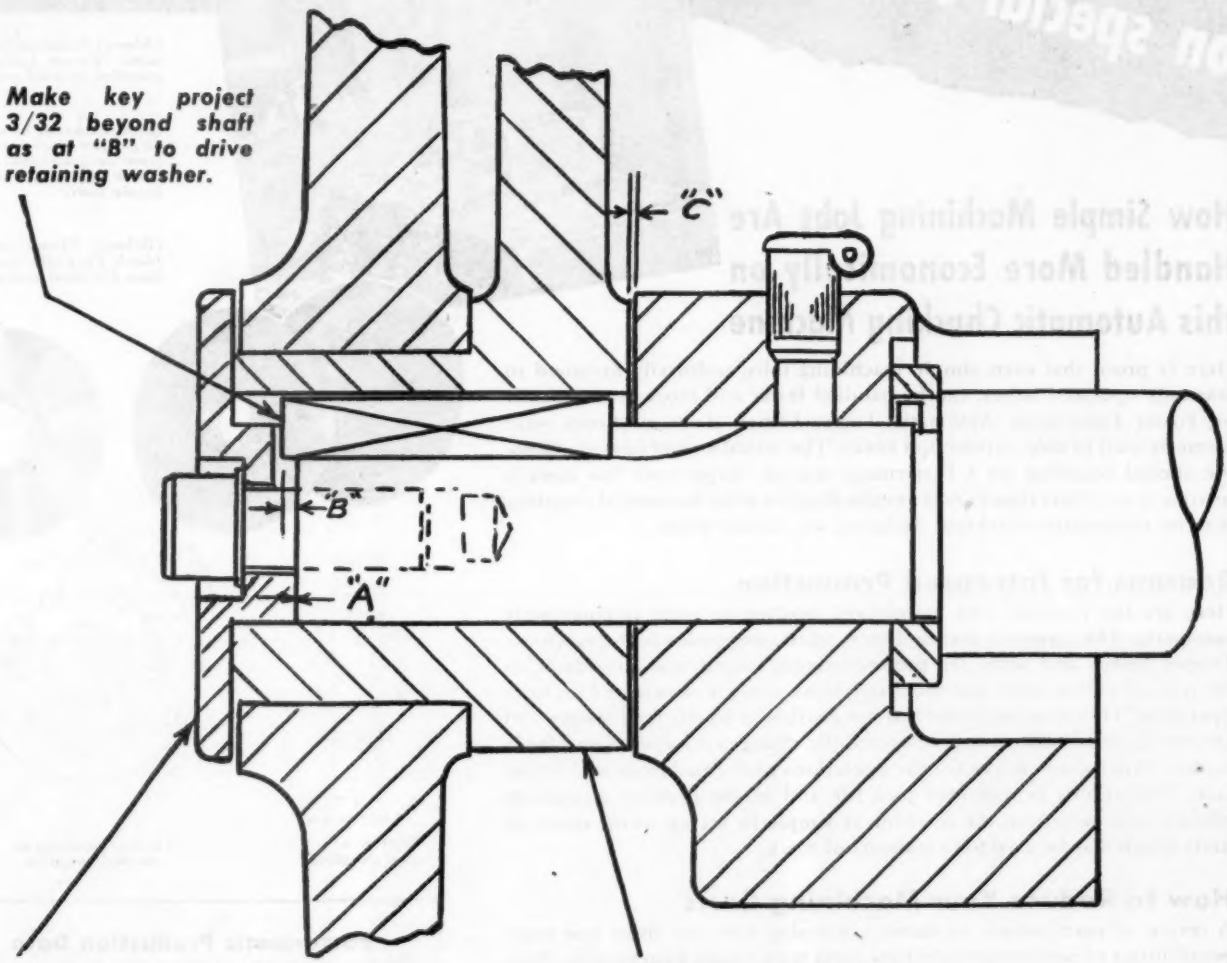
A Good Mechanic Knows and Cares For His Machine

LANDIS REG. U.S. TRADE MARK PAT. OFF. THREAD TIPS

In the Interest of Efficiency, Better Workmanship and Higher Production

LANDMACO THREADING MACHINE

HAMMER BLOW HANDWHEEL ADJUSTMENT



Make key project 3/32 beyond shaft as at "B" to drive retaining washer.

File retaining washer to fit metal to metal at "A" and with .002 max. clearance at "C."

Adjusting screws not required in lever. Remove before making adjustment.

NEW PARTS REQUIRED:

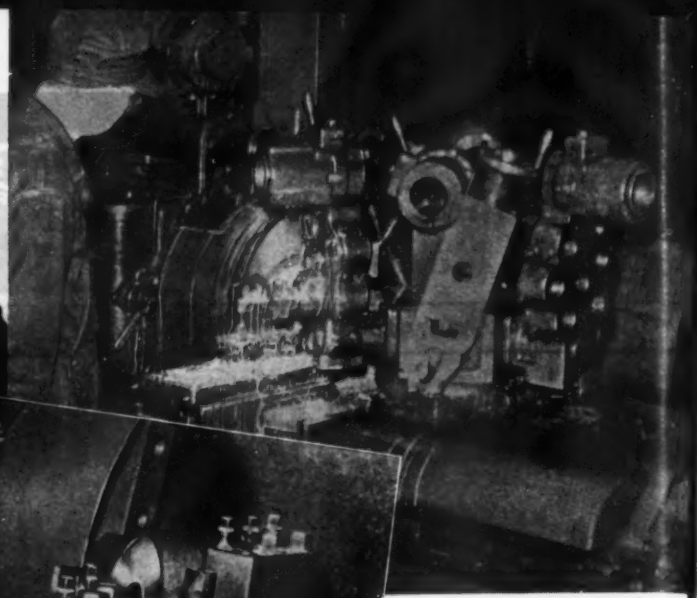
1-1½ LANDMACO
1-washer #EA 8458
1-washer 3W-⅜
1-screw 115 ⅜ x 1

2-2½ LANDMACO
1-washer #EA 9141
1-washer 3W-½
1-screw 115 ½ x 1¼

WAYNESBORO, PENNSYLVANIA, U.S.A.

THREADING MACHINERY—THREAD CUTTING DIE HEADS—COLLAPSIBLE TAPS

FASTERMATIC saves up to 50% machining time on special coupling...



(Above) Fastermatic 2FU Automatic Turret Lathe tooled to machine special coupling.

(Left) Close-up of special coupling. Riser blocks are used on the front and rear tool slides. Note chuck step jaws which stop and locate part.

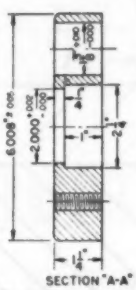
(Below) Flame cut coupling blank. Partially machined coupling. Finished coupling.

How Simple Machining Jobs Are Handled More Economically on this Automatic Chucking Machine

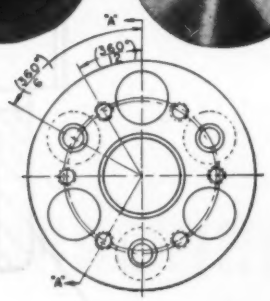
Here is proof that even simple machining jobs, ordinarily assigned to manually operated lathes, can be handled faster and more economically on Foster Fastermatic Automatic Turret Lathes. Two machines were formerly used to meet production needs. The manufacturer now machines the special coupling on a Fastermatic stating "experience has already proven ⅓ to ⅓ less time is now required to machine the special coupling than on competitive machines designed for similar work."

Reasons for Increased Production

Here are the reasons. The Fastermatic machining cycle is completely automatic. The operator merely loads, starts, and unloads the machine. Proper speeds and feeds are predetermined, taking into consideration the type of cutting tools and the material cut, and are maintained for each operation. This is accomplished by the flexible hydraulic feed system and automatic speed control that automatically changes the speeds and feeds for each work diameter, or for the operations performed from each turret face. This results in extended tool life and in the greatest machining efficiency. In addition, the machine is simple to set up using standard tools which may be used for a majority of work.



Section of special coupling.



Outline drawing of special coupling.

How to Reduce Your Machining Costs

A review of your present or future machining jobs can show you many possibilities of reducing production costs with Foster Fastermatics. Consideration of this automatic lathe need not be confined to intricate work or long runs because it can be used profitably on simple jobs run in lots as low as 30 pieces. Foster engineers will be glad to analyze your machining problems and recommend the correct Fastermatic and proper tooling for your needs.

Free Fastermatic Facts

Every production man should know the Fastermatic facts and data contained in this free catalog. Write for your copy today. Address Foster Division, 1100 Beardsley Ave., Elkhart, Indiana.

Fastermatic Production Data

PART—Special coupling.
MATERIAL—S.A.E.-1030 flame cut blank.
HOLDING METHOD—Pneumatic 3-jaw chuck.
SPEEDS—3rd Position 264 RPM.
4th Position 264 RPM.
5th Position 424 RPM.
6th Position 776 RPM.
FEEDS—3rd Position .303"
4th Position .071"
5th Position .245"
6th Position 1.992"
MACHINING TIME—4 minutes, 18 seconds.
LOADING AND UNLOADING—30 seconds.
FLOOR-TO-FLOOR TIME—4 minutes, 48 seconds.

INTERNATIONAL MACHINE TOOLS

Foster Division - Elkhart, Indiana

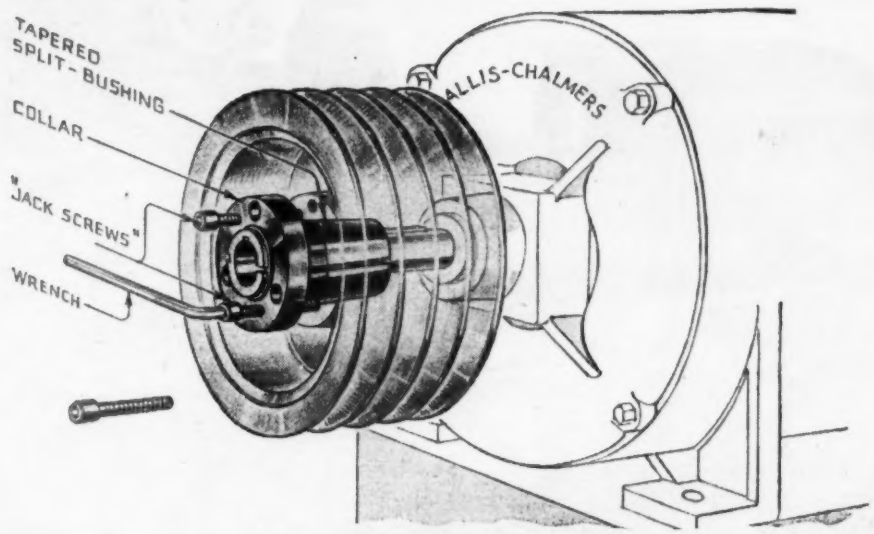
INTERNATIONAL DETROLA CORPORATION

DETROIT, MICHIGAN • ELKHART, INDIANA • INDIANAPOLIS, INDIANA

FOSTER FASTERMATICS • LIBBY HEAVY DUTY TURRET LATHES • STANDARD TOOLS • SUPERFINISHING MACHINES • SPECIAL MACHINE TO

X-Ray View

OF ALLIS-CHALMERS' NEW "MAGIC-GRIP" SHEAVE



Fastest mounting and demounting sheave on the market, the new "Magic-Grip" costs you nothing extra.

1 **Remove three capscrews** from bushing collar. A handy wrench — supplied with each sheave — is the only tool needed to remove Allis-Chalmers' new "Magic-Grip" from motor or machine shaft quickly and easily.

2 **Insert two capscrews** in tapped holes. As screws are turned, they become levers . . . automatically breaking tight grip of tapered split bushing on sheave and shaft. Entire unit is then ready for removal.

3 **Remove sheave from shaft.** Requires no mallet, no prying, no bulging muscles. You just slide the sheave off . . . smoothly, quickly. *It costs nothing extra!* Send for B6310. Allis-Chalmers, Milwaukee 1, Wis.

A 1770

Allis-Chalmers Texrope

"MAGIC-GRIP" SHEAVES

NEW SMALL HYDRAULIC U

10"x 20" TYPE H

FOR ALL TYPES OF GRINDING

Cylindrical
Shoulder
Internal
Taper • Face

Precision Tool Room Work • Production of Small Parts to Close Limits

10"x 20" TYPE H HYDRAULIC UNIVERSAL GRINDER

LANDIS TOOL

Precision Grinders

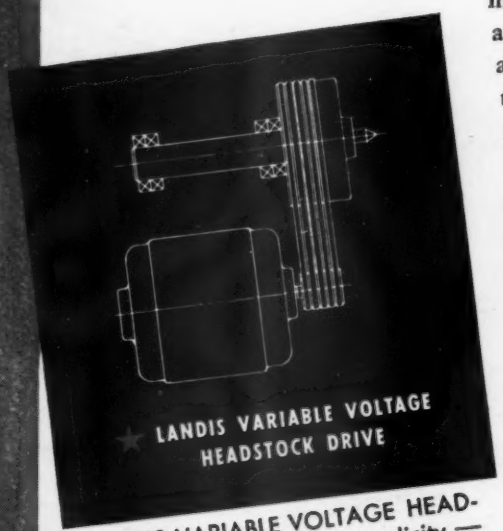
LANDIS TOOL CO.

UNIVERSAL GRINDER

✓ Flexible Operation
✓ Close Accuracy

● In the new small LANDIS TOOL 10"x 20" Type H Grinder the flexible operation and close accuracy are due to its universal features. Swivelling headstock and grinding wheel plus ease of setup and control make short production runs of small parts practical to instrument and aircraft accuracy.

LANDIS TOOL special features that contribute to accuracy and fine finish are: microsphere wheel spindle bearings; dynamically balanced rotating parts; and normalized, pre-aged castings. The variable voltage headstock drive is an exclusive LANDIS TOOL feature that provides an infinite number of speeds between 90 and 600 rpm. Fully electric with convenient rheostat control, it permits selection of the best speed for maximum production and finest finish. Fewer rotating and wearing parts are needed. Matched vee belts direct connected to motor and spindle plus only two preloaded super precision ball bearings eliminate vibration and give finer finishes. For further information, request Bulletin I45.



LANDIS VARIABLE VOLTAGE HEADSTOCK DRIVE. Note simplicity — two rotating parts, two bearings, matched vee belts.

Landis Tool Special Features:

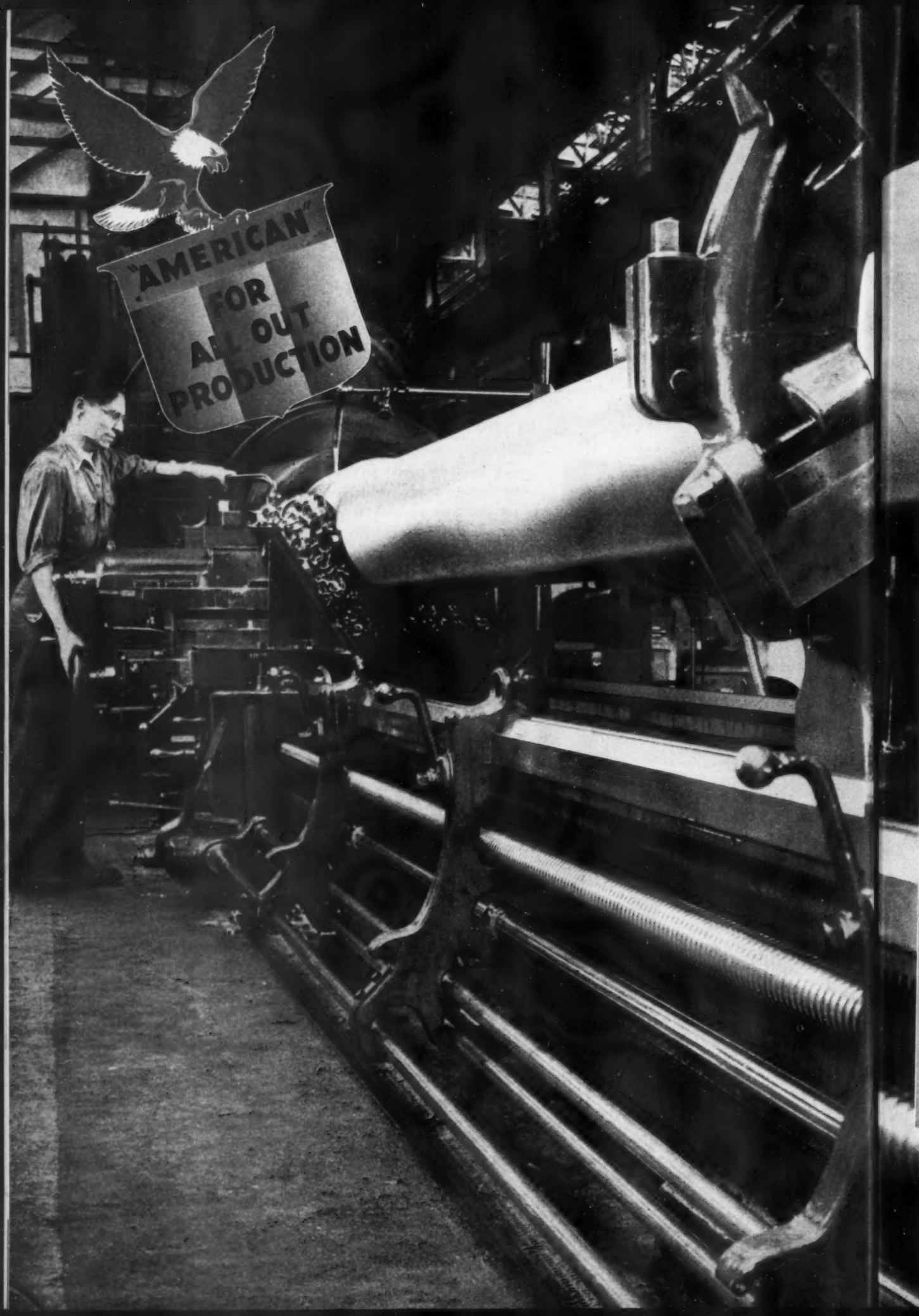
★ ***VARIABLE VOLTAGE HEADSTOCK DRIVE***
★ ***MICROSPHERE WHEEL BEARINGS***
★ ***DYNAMICALLY BALANCED PARTS***
★ ***NORMALIZED CASTINGS***

CONDENSED OPERATING DATA

Max. Dist. Between Work Centers 20"
Max. Work Swing 10¾"
Max. Work Dia. (10" wheel) 10"
Work Speed rpm. 90-600
Traverse Speed Range — 3" to 120" per min.
Headstock—swivels each way 90°
Grinding Wheel
Head swivels each way 90°
Lower base swivels each way 90°
Wheel Feed Increment range .0003" - .003"

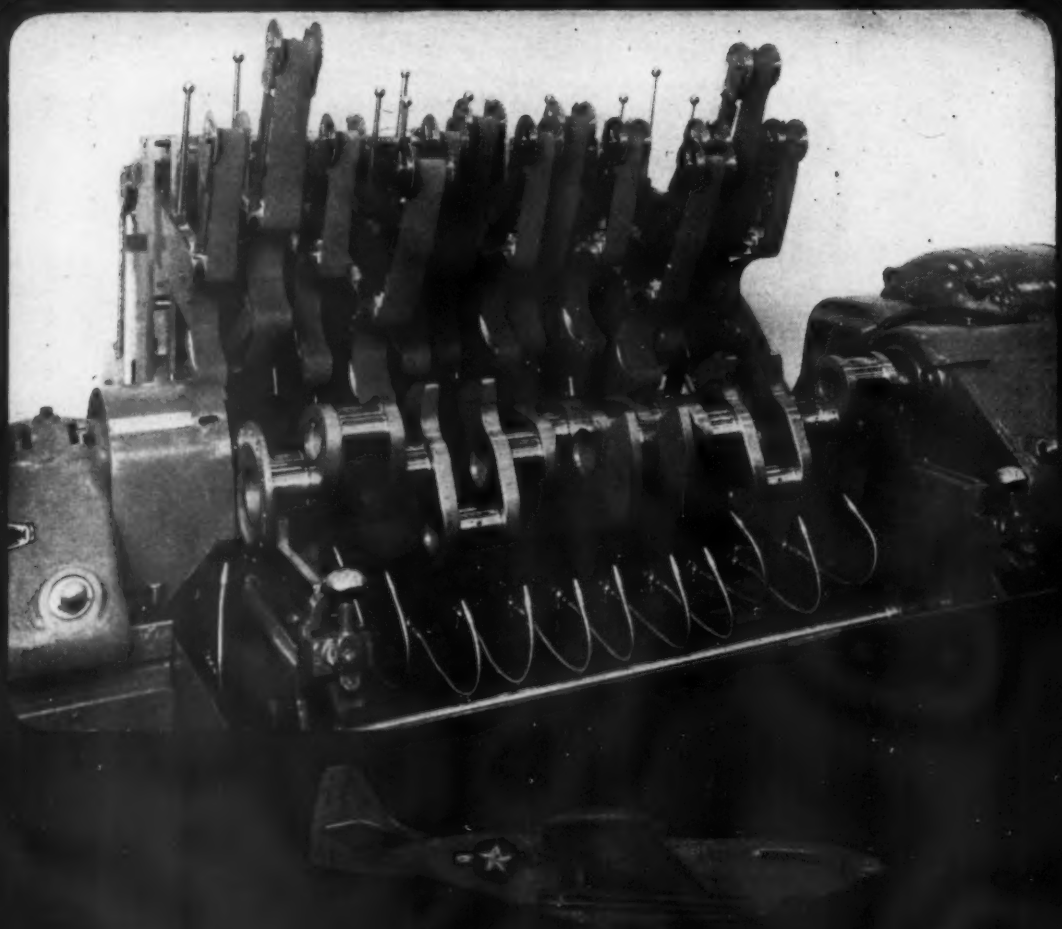
LANDIS TOOL Company

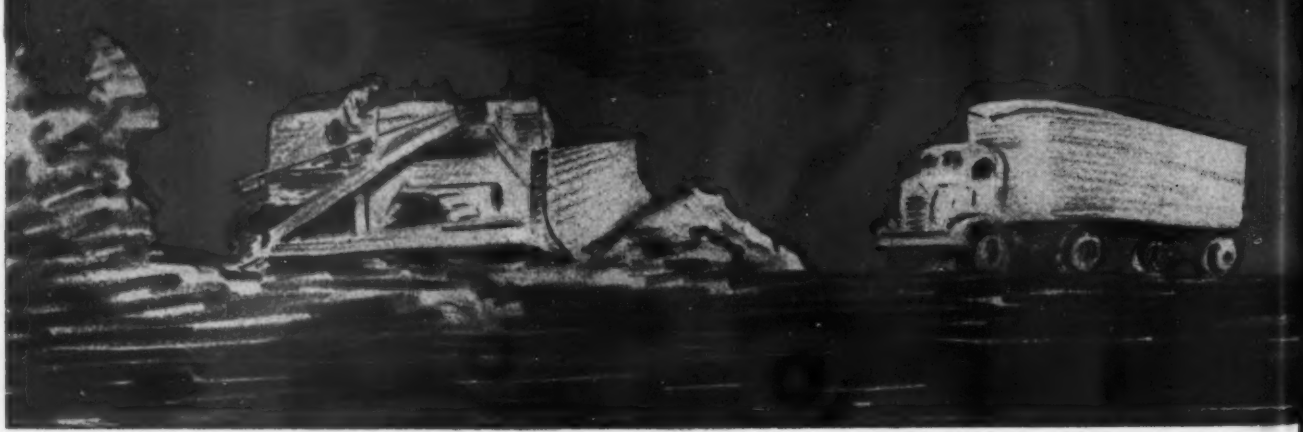
WAYNESBORO, PA.


"AMERICAN"
FOR
ALL OUT
PRODUCTION

MIGHTY LATHES Turn MIGHTY
SHAFTS for THE U.S. NAVY
"AMERICAN" 48" Lathes, both in Navy Yards and Contractors' Plants, are adding their enormous power and productive capacity to the building of our "two-ocean" Navy.
"AMERICAN" Lathes, from 14" to 48" sizes, are fast—powerful—accurate. They are meeting the challenge of War demands like all true AMERICANS.
THE AMERICAN TOOL WORKS COMPANY
Lathes - Radials - Shapers
CINCINNATI, OHIO, U. S. A.

LAPS ALL PINS and BEARINGS AT ONE TIME . . .





The NORTON CRANK-O-LAP*

THE NORTON Type 40 CRANK-O-LAP Machine conserves manpower — saves the time of many workers. Used for lapping crankshafts for large motors — tractors, tanks, trucks, boats and airplanes.

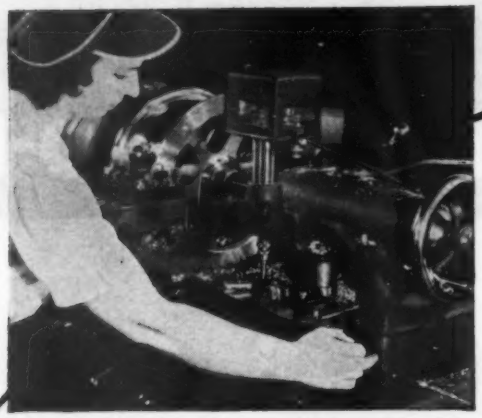
Finishes in a single operation all crank pins and journal bearings. The lap arms carrying abrasive paper tapes are activated hydraulically for improved, uniform finish. Special arm design gives uniform lap pressure; timing devices predetermine work cycle.

Produces surface finish scientifically proved most suitable for high speed engine bearings.

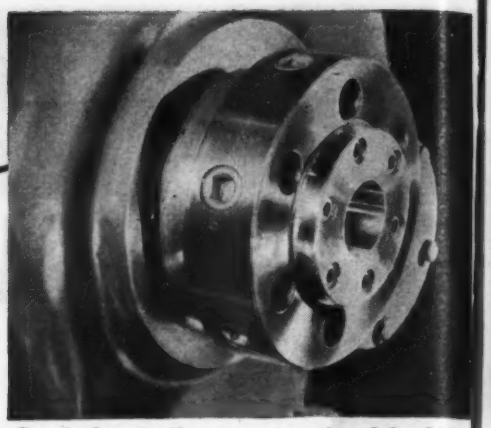
NORTON COMPANY • WORCESTER 6, MASS.

* Registered trade mark

M-498



More production—fewer rejects: even without highly skilled operators, this 18" Monarch-Keller lathe showed an 800% increase in machining 26" diameter army tank wheels. Automatic turning from a thin metal template assured continued high-quality production.



Camlock spindle nose: introduced by Monarch in 1929. Retains accuracy during life of the lathe. Saves time in attaching and removing chucks and plates—holds them accurately and rigidly to the spindle.

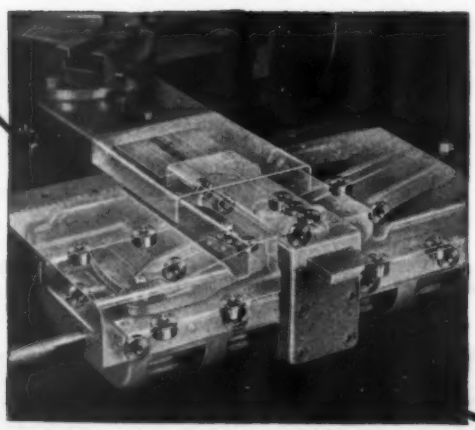
BUILT-IN FEATURES RETAIN MONARCH ACCURACY

Faulty turning to scrap

Only one person profits from inaccurate or badly finished work—the scrap dealer. Losses from such causes have no place in industry when they can be avoided by the use of better, more modern equipment.

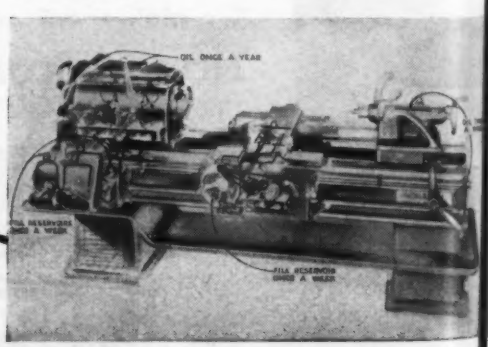
It is no accident that Monarch turning machines reduce such losses. Accuracy is an integral part of Monarch. It's been our creed since the first Monarch was built, more than 30 years ago. Most of the devices to improve turning accuracy were pioneered by Monarch.

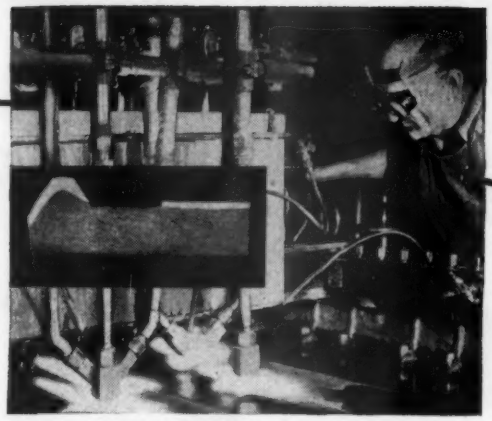
Nor was it just a coincidence that Monarch lathes were specified for so much vital war production, especially in the aviation pro-



Ball-bearing taper turning attachment: turns or bores accurate smooth tapers under all conditions. Permits heavier cuts than with conventional type of attachment. Nothing to wear or get out of adjustment to reduce accuracy of the attachment.

Automatic force-feed lubrication: makes lubrication as "foolproof" as possible by requiring minimum attention from operators or maintenance men. Permits utilization of production and accuracy features to the full power and speed of the lathe.





Flame-hardened bedways: **by preventing, under proper use, wearing, scoring, scratching and pitting of bedways, this Monarch development of 1937 helps Monarchs retain their original accuracy throughout the life of the lathes.**

pays a profit— dealers

gram. Plant management had proved from long experience that the last piece of a million-piece lot has the same blueprint accuracy as the first one.

Whether you use your turning machines for toolroom or production work, you can count on Monarch's accuracy. You can depend on them to maintain the pace required for low-cost production. Monarch turning machines will help you produce more goods for more people at lower cost, and give your customers, the American workers, a chance to earn more, buy more, have more.

Monarch Model W 16" Lathe: **Built-in features and advantages developed by Monarch prevail throughout the entire line of toolmakers, production and special Monarch lathes. No other line offers so many and so important developments to improve accuracy, reduce turning costs and provide years of satisfactory operation.**

THE MONARCH MACHINE TOOL COMPANY • SIDNEY, OHIO

DIRECT FACTORY BRANCHES

CHICAGO 6, ILLINOIS
622 W. Washington Blvd.
Phone: Randolph 4295

DETROIT 2, MICHIGAN
801 Fisher Building
Phone: Trinity 1-0426

NEWARK 2, NEW JERSEY
635 Industrial Office Bldg.
Phone: Mitchell 2-1770

CLEVELAND 6, OHIO
Room 209 Upper Carnegie Bldg.
10465 Carnegie Avenue
Phone: Garfield 2590

INDIANAPOLIS, INDIANA
Maco Building
38 and College Avenue
Phone: Wabash 2650

PITTSBURGH 22, PENNSYLVANIA
512 Empire Building
Liberty Ave. and Stanwix St.
Phone: Atlantic 6428

Representatives in Principal Cities

Monarch Saves Time

Tough Grinding Jobs MADE EASY with Thor PORTABLE AIR GRINDERS

On the heaviest, toughest type of grinding jobs Thor rotary air grinders are unsurpassed for turning out a large amount of work each day. Extremely well balanced and ruggedly built, Thor portable grinders are leading the field for dependable, continuous service at a minimum maintenance cost. These efficient grinders have an abundance of mighty power and yet are exceptionally thrifty on the air they require to operate.

WIDE RANGE OF SIZES AND MODELS

There are 50 different sizes and models of Thor rotary air grinders . . . a model for any and every type of grinding job. All of the models can be furnished with either of the three throttle types shown. For full details, specifications, prices and delivery information, write for Thor Catalog No. 52B.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 W. Jackson Blvd., Chicago 6, Illinois
Los Angeles New York

Straight Throttle
The straight throttle permits a constant flow of air into the tool without the necessity of keeping the lever continually depressed. The machine will not stop operating until the valve is manually closed. For grinders up to 4" capacity vitrified wheels, it is the most widely used handle type.

Grip Throttle
The grip throttle is the most desirable type for grinders of 6" wheel capacity and larger. It is adapted for overhead operation, for working in close and awkward places, and for work where a straight forward thrust of the machine is desired. On the grip handle, the throttle is self-closing when the trigger is released

Lever Throttle
Safety is the primary feature of the lever throttle. The instant the lever is released the power is cut off. This automatic action is helpful in hazardous work on construction and maintenance, and reduces accidents due to carelessness.

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

New ideas in highway busses include: separate engines for each driving wheel, hydraulic transmission, increased use of aluminum, 50 passenger capacity, two decks, wider treads and steam power. *Business Week.*

get ready with CONE for tomorrow

A new process deposits a ceramic insulating covering on electric wire. *Sprague Electric Co., N. Adams, Mass.*

get ready with CONE for tomorrow

A new storm-proof wire for rural electrification is made of steel wire covered with copper. *American Steel & Wire Company.*

get ready with CONE for tomorrow

About 10% will be added to the country's cold storage capacity if plans to use a 12 million cubic foot limestone mine for that purpose are successful. *Food Industries.*

get ready with CONE for tomorrow

"Molecular distillation" is now out of the laboratory stage and promises to do such incredible jobs as to separate fish oil from its smell. *McGraw-Hill Overseas Digest.*

get ready with CONE for tomorrow

A hardware wholesaler carrying 50,000 items plans to set up a chain of "cafeteria style" hardware stores after the war. *George Worthington Co., Cleveland.*

get ready with CONE for tomorrow

Claims for the new home heater developed by the Bituminous Coal Institute include: one-third reduction in fuel use, 50 hours of heat in one stoking, cost under $100. To parallel this development, Anthracite Industries Inc. has a furnace 2 x 3 x 3 feet that weighs only 75 pounds. It consists of a tube with the coal entering at one end and ashes forced out at the other. *Coal Age.*

get ready with CONE for tomorrow

A new surgical lamp projects a cone of ultraviolet radiation, through which germs cannot pass, around the wound. *Hanover Chemical & Mfg. Co.*

One of the large oil companies announces a motor lubricant claimed to be unaffected by temperatures from 100 below to 200 above zero. *Cities Service Oil Co.*

get ready with CONE for tomorrow

A new stirring device is driven by an extended motor that revolves the internal rotor by magnetic attraction. *Ohmite News.*

get ready with CONE for tomorrow

A large trucking company, operating in eleven states, plans to add air freight service as soon as planes are available. *All States Freight Inc.*

get ready with CONE for tomorrow

A chemical company has produced a solution which, it claims, will prevent runs in stockings and may be applied with a sponge. *Monsanto Chemical Co.*

A flashlight, in which battery, bulb, and lens are cast in a cylinder of wax, is said to be cheap enough to throw away when its batteries are exhausted. *Geyaun Manufacturing Co., Charlestown, Mass.*

get ready with CONE for tomorrow

The electron micro-analyzer reports on the atomic composition of particles too small to be seen by microscopes. By its use the point of a common pin can be made to look as vast and rough as a mountain range. *Optical Society of America.*

get ready with CONE for tomorrow

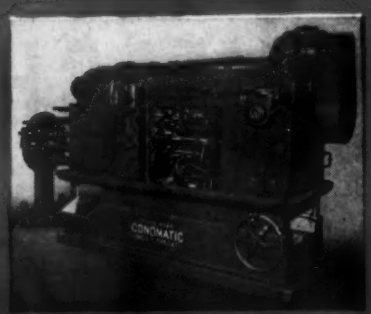
In war planes the present type of engine is twice as efficient as jet propulsion at 150 miles per hour; the two are equal at 300 miles; and at 550, jet propulsion is twice as efficient. *EMPIC No. 7.*

get ready with CONE for tomorrow

Steam busses, now being designed, appear to have many advantages, including smooth operation, no idling, no fumes, low operating cost, engine braking, and longer service between overhauls. *Bus Transportation.*

Automatic Production at automatic-cannon speed

The 1⅝" 8-Spindle Conomatic produces these 20mm. tracer bullets in 8 seconds each. Production like this keeps shell supplies ahead of the requirements of rapid firing guns. Conomatics, in wartime, are a military necessity — in peacetime, an economic necessity.



CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

16

For the

IMPORTANT

work of sharpening broaches

Broach sharpening on Ex-Cell-O small broach sharpening machine, Style 80 (for round broaches).

USE EX-CELL-O BROACH SHARPENING MACHINES

MANY years of experience in the production of broaches, broaching fixtures, and precision machine tools form the background for the design and manufacture of Ex-Cell-O broach sharpening machines. Each machine is built to give the utmost in speed, accuracy, and economical production. Each combines simplicity and ruggedness in construction, with modern streamlined appearance. These new Ex-Cell-O broach sharpening machines are special purpose machines. They are ideal for large production set-ups, and are advantageous also for occasional work. By the use of such machines, set-up time is highly minimized, and the hazard in changing equipment is practically eliminated. *See an Ex-Cell-O representative today.*

EX-CELL-O CORPORATION

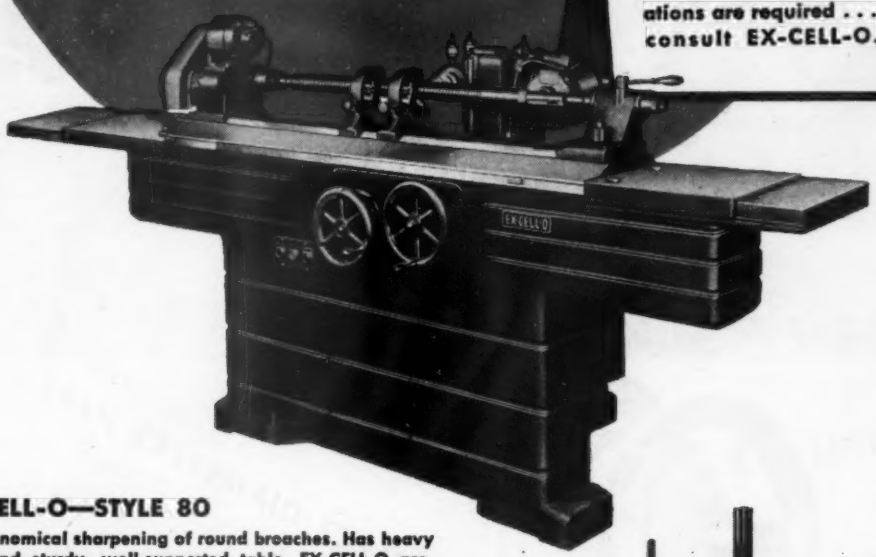
XLO

EX-CELL-O *for* PRECISION

EX-CELL-O—STYLE 81-L

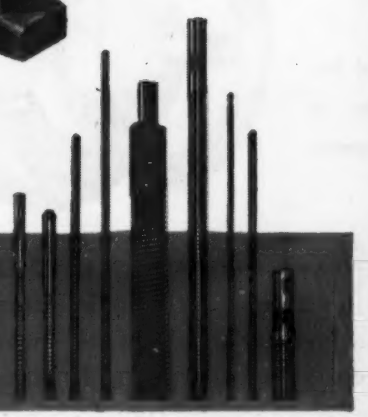
For sharpening flat broaches and grinding straight slots, keyways, and grooves to close tolerances. The cross travel of the spindle is manually operated. Adjustable stops are provided so that spindle travel in either direction can be accurately limited when necessary. Ex-Cell-O broach sharpening machines have been thoroughly tested by years of actual use in Ex-Cell-O plants.

Where increased production, high accuracy and greater economy through multiple operations are required . . . consult EX-CELL-O.



EX-CELL-O—STYLE 80

For economical sharpening of round broaches. Has heavy base and sturdy, well-supported table. EX-CELL-O precision ball bearing spindle assures freedom from vibration, maximum service life, and a good grinding finish. V-belts and 3-step pulleys allow a practical range of work speeds. Push button controls are located on the front of the machine for safety and convenience.



4 MODELS
EX-CELL-O BROACH SHARPENING MACHINES

- No. 80—Small Machine for Round Broaches
- No. 80-L—Large Machine for Round Broaches
- No. 81—Small Machine for Flat Broaches
- No. 81-L—Large Machine for Flat Broaches

Standard and Special Multiple Way-Type Precision Boring Machines

•

Multiple Drilling and other Special Purpose Machines

•

Precision Thread Grinding Machines

•

Precision Lapping Machines

•

Broaches and Broach Sharpening Machines

•

Continental Cutting Tools

•

Tool Grinders

•

Hydraulic Power Units

•

Grinding Spindles

•

Drill Jig Bushings

•

Fuel Injection Equipment

•

R. R. Pins and Bushings

•

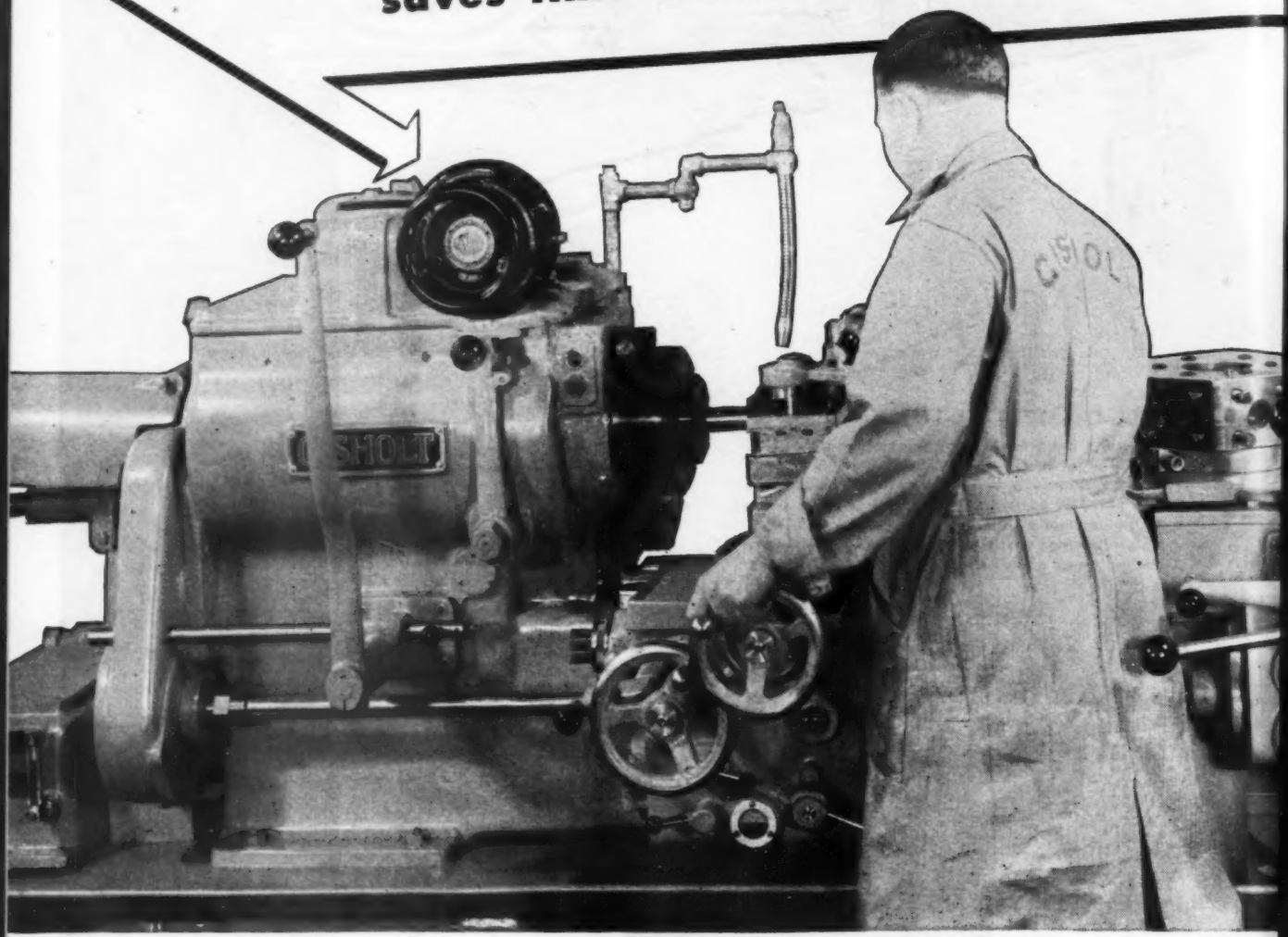
Pure-Pak Paper Milk Bottle Machines

•

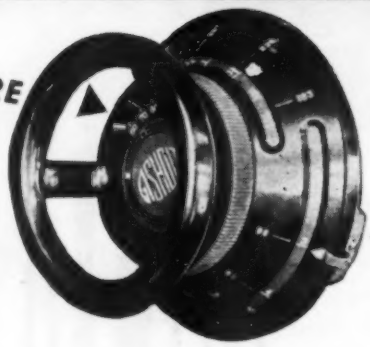
Aircraft and Miscellaneous Production Parts

N DETROIT 6, MICHIGAN

How the GISHOLT HYDRAULIC SPEED SELECTOR saves time and trouble . . .



SET CUTTING SPEED HERE



There is a "best" cutting speed for machining with every combination of material and tool. Set that cutting speed here by turning the knurled ring.

SELECT DIAMETERS HERE

The operator merely turns the handwheel to the diameter of each successive cut. The Selector automatically shifts to the proper spindle speed.

The Gisholt Speed Selector is power-operated. Actual shifts are made instantly to any one of 12 spindle speeds, making it easier for the operator always to use the most efficient cutting speed for the work at hand. There are no time-wasting calculations—no complicated adjustments. And no physical effort is required of the operator.

Actuated by a mere touch to the wheel, the Speed Selector functions automatically, leaving the operator free to index turret and present new tools to the work, eliminating the waste of operator time between cuts.

The Gisholt Speed Selector increases production—helps to improve the quality of machining work. Write for literature.

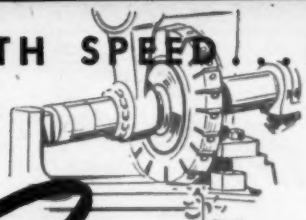
GISHOLT MACHINE COMPANY • *1201 East Washington Avenue, Madison 3, Wisconsin*

Look Ahead . . . Keep Ahead . . . With Gisholt Improvements in Metal Turning

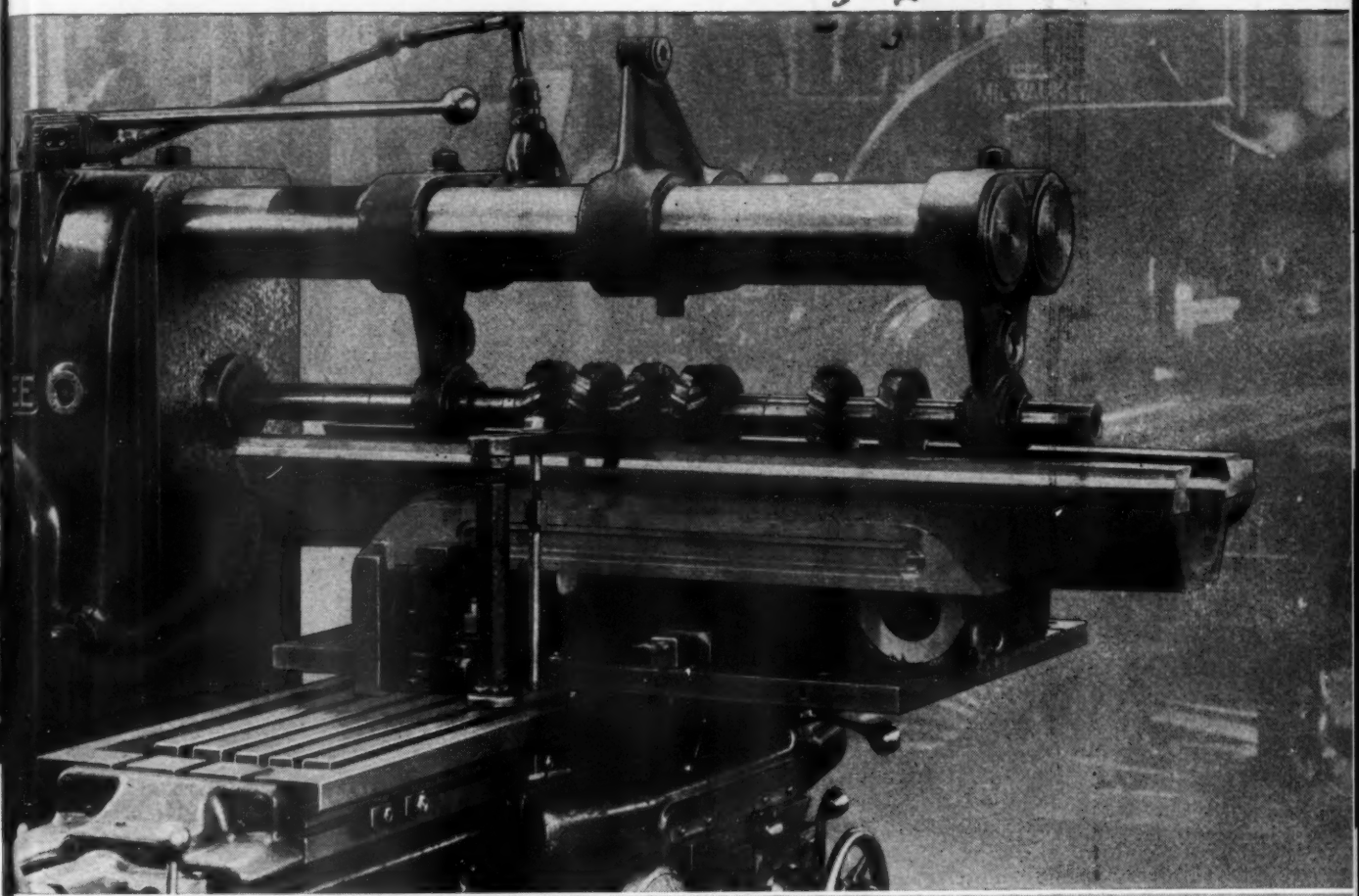
GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

TO MILL IT . . . WITH SPEED . . . PRECISION . . . PROFIT



"PUT IT ON A *Milwaukee*"

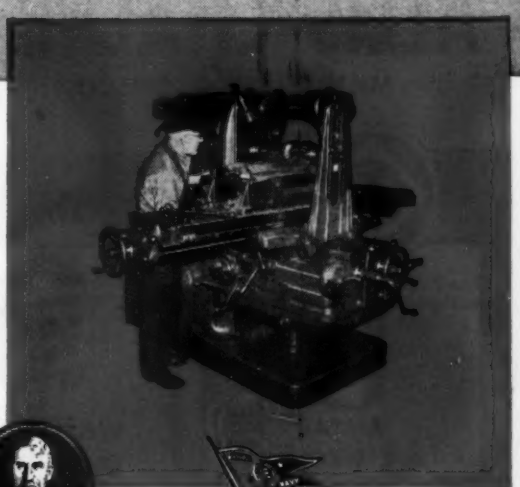


Five side-milling cutters and one pair of interlocking side-milling cutters are mounted on a special 51-½B42 Milwaukee Arbor held in the spindle of a Milwaukee 4H Milling Machine. Two arbor braces support the arbor while a third increases overarm rigidity. Seven faces are straddle milled simultaneously in this set-up in which the knee is fed vertically.

Taking the tough jobs in stride — setting the pace in production milling — standing up with precision performance through the years — these qualities have made "Milwaukee" a top ranking name in milling machines.

Their ability to crack many a milling problem is reflected in the popular expression of machine tool men—"put it on a Milwaukee." Time-tested, production-proved, modern in every detail of design and construction but free of frills and novelties Milwaukee Milling Machines yield the sustained performance — with precision and speed — that spell profit in milling operations.

Select your milling equipment from the Milwaukee line of more than 70 models — the PoweRated Milling Machines — every machine engineered and built with ample power for every class of job.

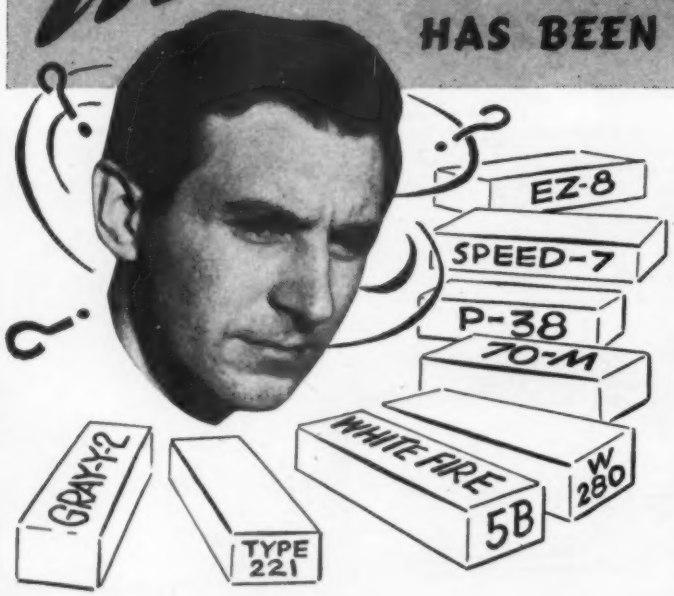


Milwaukee Machine Tools

KEARNEY & TRECKER
CORPORATION
MILWAUKEE 14, WISCONSIN

The Art of Buying

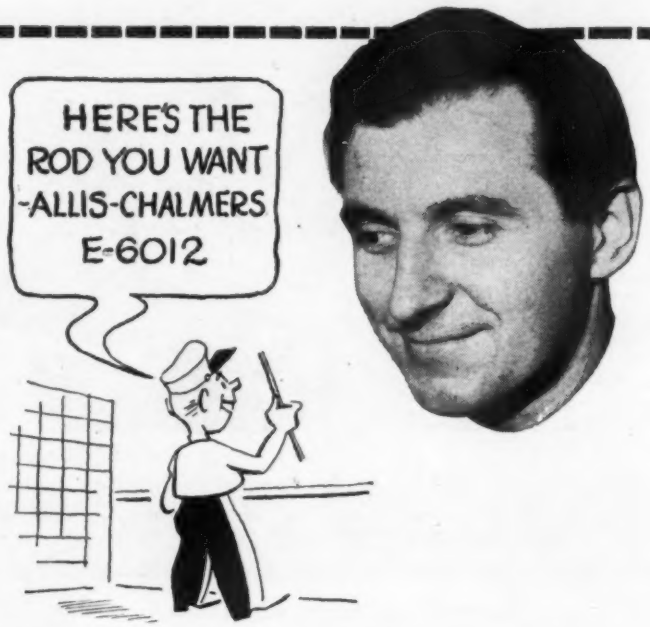
ARC WELDING ELECTRODES HAS BEEN GREATLY SIMPLIFIED...



It used to be.. a puzzling situation — those electrodes with confusing trade names and trade numbers. Each manufacturer's identification system was different, each one had his own special name for electrodes. Thus, for example, one particular rod designated by American Welding Society as E-6012 had over twenty different trade names. And no two trade names were even vaguely similar. To a welder selecting a certain rod for a definite job these varying trade names were disconcerting. They had *no* connection with any standard welding classification. Unless he had previously used the rod or took time to check into its classification, he was at a loss to select the correct electrode.

..But now Allis-Chalmers has cut through this mass of confusion and greatly simplified the business of buying electrodes. Official *AWS classification numbers* have been adopted for Allis-Chalmers electrode identification. Thus *AWS E-6012* becomes *Allis-Chalmers E-6012* in the A-C electrode line. It's logical and practical. Correct selection is automatically assured.

Shop-tested and production-proven in A-C's own huge plants, these electrodes are available now at Allis-Chalmers welding dealers and district offices. Write for bulletin B6340. A 1780



ALLIS-CHALMERS

MILWAUKEE 1, WISCONSIN

HEADQUARTERS FOR WELDING EQUIPMENT

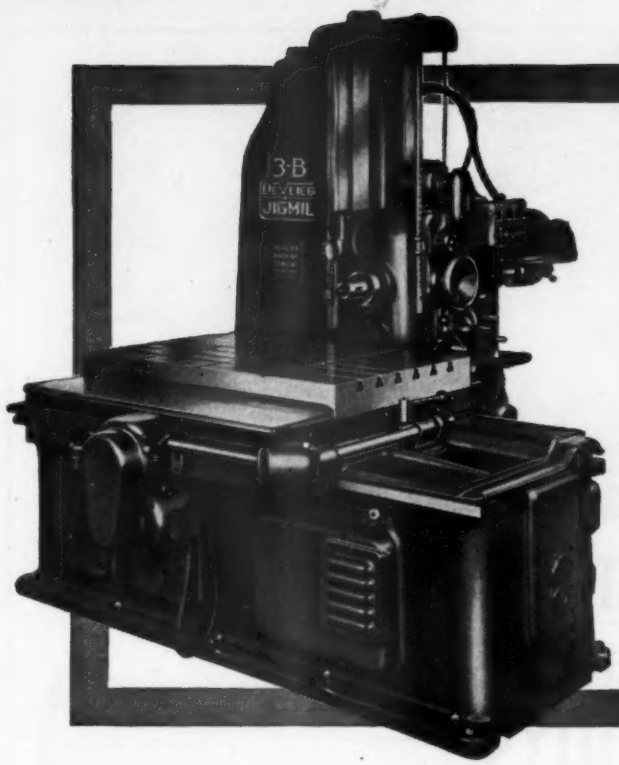
AMPAC
A-C WELDERS

WELD-O-TRON
D-C WELDERS

ALLIS-CHALMERS
ELECTRODES

ARC WELDING
ACCESSORIES

♪ *Tune in the Boston Symphony, Blue Network, every Saturday at 8:30 pm, EWT.*

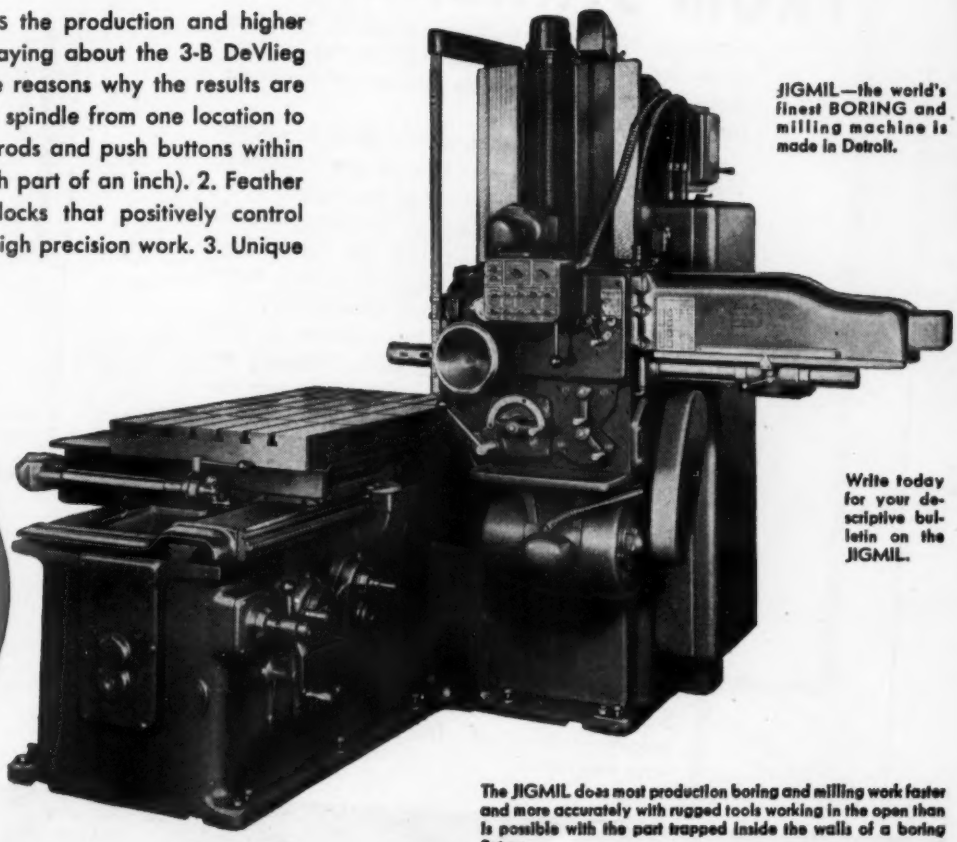


★

The JIGMIL has proven to be a totally new approach to the problems of economical precision BORING and milling . . .

★

"TWO TO THREE TIMES the production and higher quality work" is what users are saying about the 3-B DeVlieg JIGMIL—and here are some of the reasons why the results are better: 1. Automatic positioning of spindle from one location to another in response to measuring rods and push buttons within less than .0001 (one ten thousandth part of an inch). 2. Feather touch, pressure controlled slide locks that positively control locking uniformity, so essential to high precision work. 3. Unique operation and controls that make possible high precision work with relatively little skill.



JIGMIL—the world's finest BORING and milling machine is made in Detroit.

JIGMIL YOUR WORK

Write today for your descriptive bulletin on the JIGMIL.

The JIGMIL does most production boring and milling work faster and more accurately with rugged tools working in the open than is possible with the part trapped inside the walls of a boring fixture.

DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

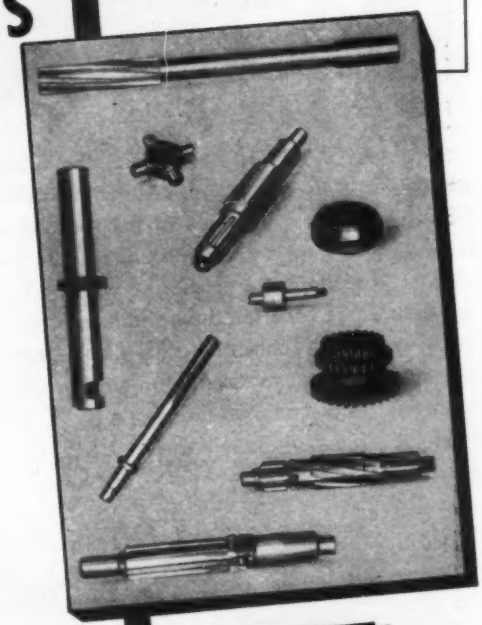
THE FITCHBURG METHOD OFFERS SPECIAL MACHINES FROM STANDARD UNITS

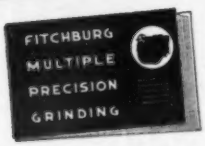
Fitchburg automatic multiple precision grinding offers the same profit possibilities that up-to-date shops now earn with multiple tooling and combined cutting on machined work.

Special machines mounting Standard Bowgage Head Grinding Wheel units, like the one illustrated, enable the precision grinding of two or more dimensions at a single handling. Grinding is completed within the time required for the longest single operation. On mass production work these Fitchburg grinders rapidly repay their cost.

On hundreds of parts like those shown, for machine, automotive or ordinance work, Fitchburg engineers can help you to make sure your orders are filled on time, and at the lowest possible cost. It will not obligate you to mail in your blueprints for study. Catalog shows wide range of other successful applications. Write for a copy today on your business letterhead.

When installing special grinding equipment it is important to remember that the Fitchburg Bowgage Grinding Wheelhead is a self-contained standard unit. It can be remounted on standard machines, or on new special bases, for operations other than the one originally specified. This feature protects your investment.





This book shows how to cut grinding costs... Sent free... write for it today.

FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U. S. A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Bath Full Universal Grinders and Special Purpose Grinders.

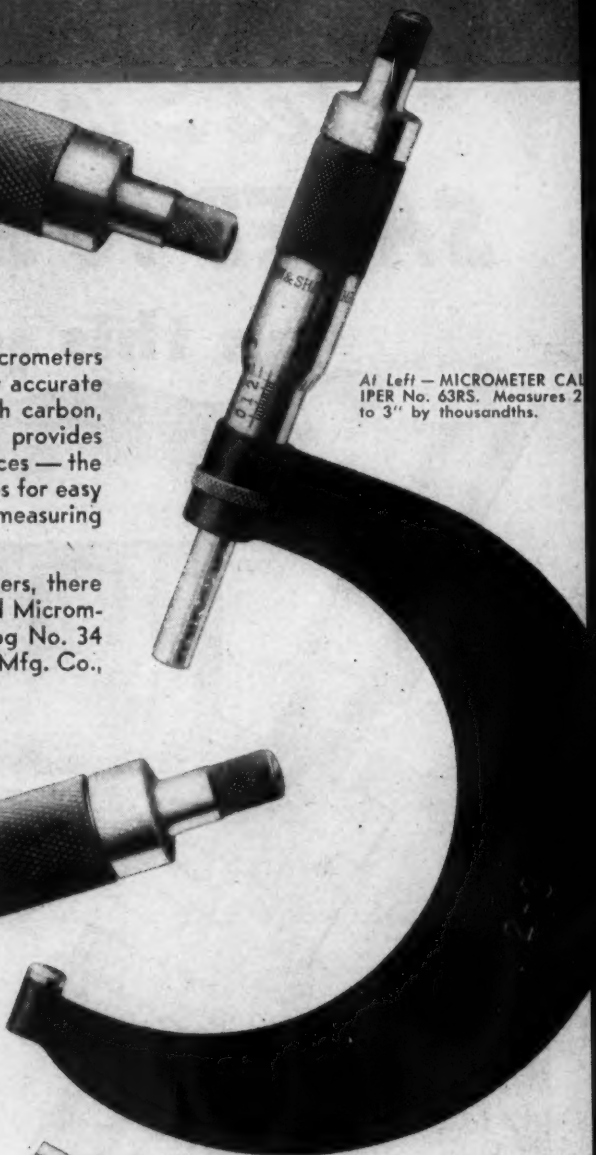
MICROMETERS

—For Many Uses—

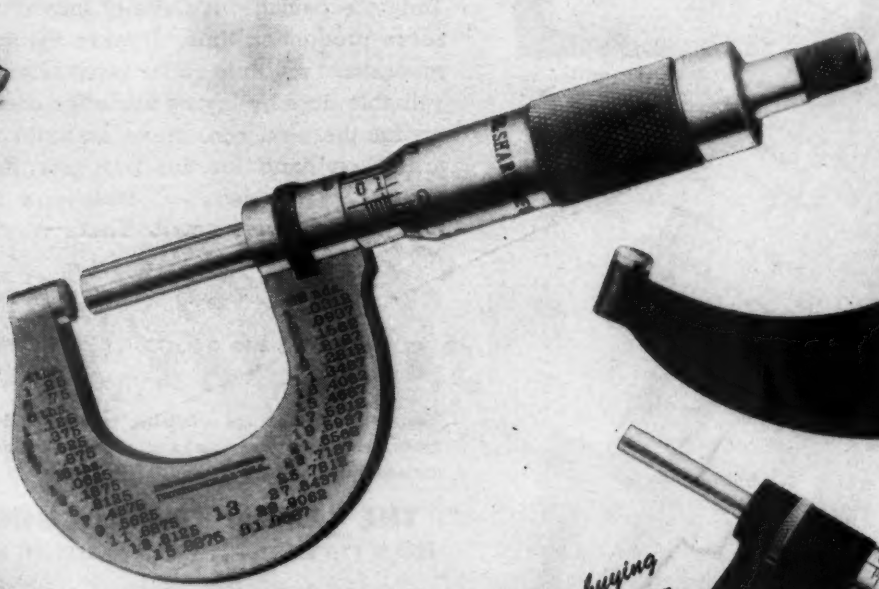
Above — SCREW THREAD MICROMETER CALIPER No. 155RS Micrometers for measuring threads and for other special work available in several stock styles.

Distinctive design features give Brown & Sharpe micrometers definite advantages. The micrometer screw, uniformly accurate from end to end — the wear resisting spindle of high carbon, high chromium steel — the adjustable thimble which provides an extremely simple adjustment for measuring surfaces — the alternately long and short graduations and large figures for easy reading. Brown & Sharpe Micrometer Calipers mean measuring excellence.

In addition to the complete line of Micrometer Calipers, there are Inside Micrometers, Micrometer Depth Gages and Micrometer Heads that cover most measuring needs. Catalog No. 34 listing complete line sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.



At Left — MICROMETER CALIPER No. 63RS. Measures 2 to 3" by thousandths.



Above — MICROMETER CALIPER No. 13RS. Measures 0 to 1" by ten-thousandths. Cutaway frame at anvil end permits measurements deep in slots.

At Left — MICROMETER CALIPER No. 71RS. Measures to 7" by thousandths. Scientifically designed frame resists distortion and is light in weight. Similar tools sizes to 12"

We urge buying through the Distributor

BROWN & SHARPE TOOLS

Yes Sir - we SAVED 10 HOURS on this job!

9 surfaces milled simultaneously and held to accurate distances.

Straddle milling job on Kempsmith Type G Milling Machine.

"Instead of knocking down the cutter and arbor set-up for this straddle-milling job, we did the sensible thing—we kept the complete set-up intact, ready for the next production run. The initial set-up required 10 hours . . . so we'll again be saving that much time on the next lot."

Today, especially, it's vitally important to conserve production time. It takes many hours to reconstruct multiple cutter assemblies. Save this valuable time by laying aside the complete set-up for the next run. Have an extra supply of arbors on hand for this purpose. Remember, arbors are "perishable" tools and their cost today is relatively small. That's why —

It always pays to SAVE THE SET-UP!

Kempsmith Arbors are available in all popular sizes and types, adaptable to any make of milling machine with standardized spindle. Mail coupon for literature.

THE KEMPSMITH MACHINE CO.
1823 S. 71st STREET MILWAUKEE 14, WIS., U. S. A.

Arbors BY KEMPSMITH

Precision Built Milling Machines Since 1888

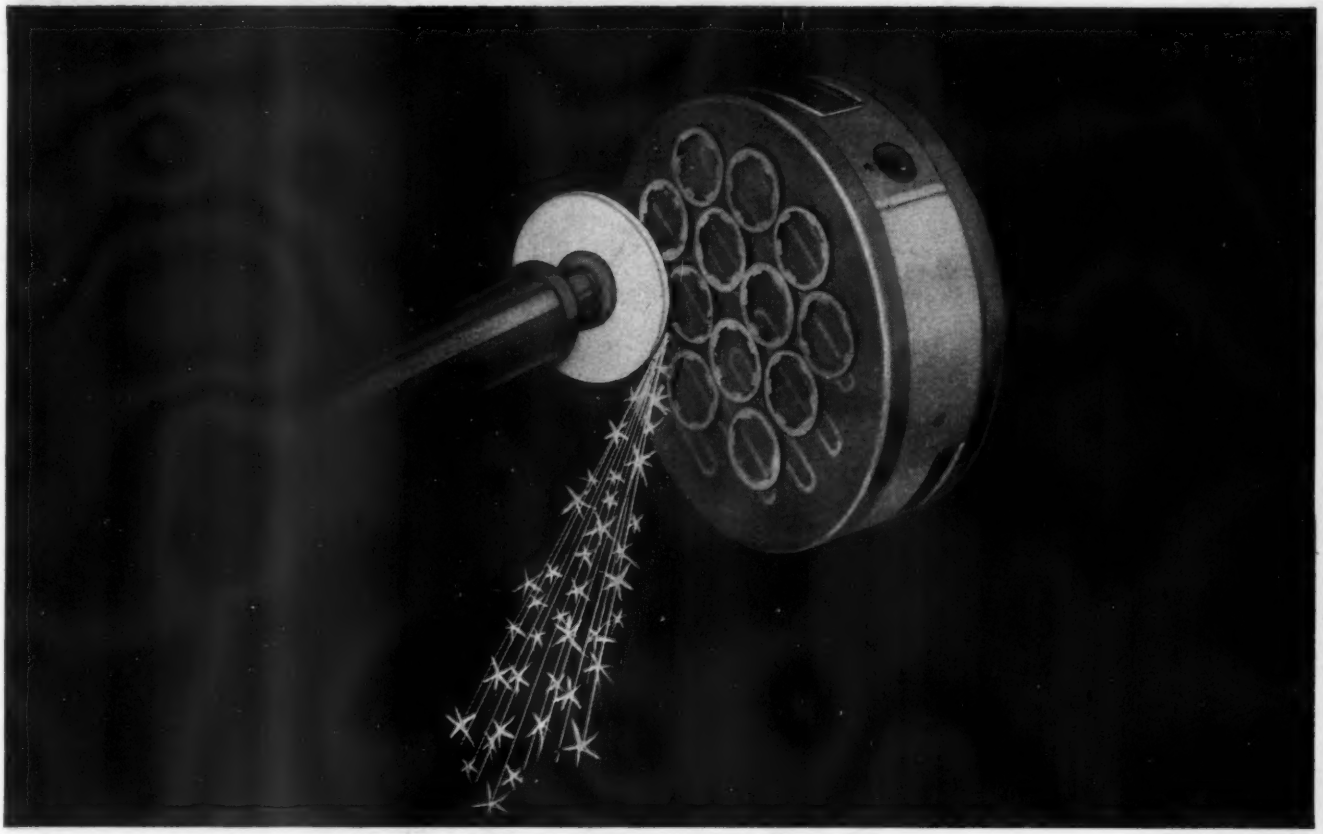
Write Today!

KEMPSMITH — Yes, I would like to receive a copy of your new Arbor Bulletin:

NAME..... TITLE.....

FIRM..... ADDRESS.....

A 4653-1P-C



GANG UP ON 'EM

For multiple surface grinds as well as internal, external and taper grinds or turns, the Lempco Model ACX Convertible is an ideal low-cost machine tool. Many important exclusive features: Automatic power cross-feed; screw and rack and pinion infeed; rapid and easy change-over from turn to grind or vice versa; longitudinal adjustment of work-head for various size jobs; 18" swing. Good delivery.

WRITE FOR CATALOG

AUTOMATIC SIZING DEVICE

Dial indicator sizes directly from work diameter. Makes it simple and easy for spindle to exactly duplicate successive pieces on long runs. Eliminates spoilage and saves valuable man-hours.

LEMPCO

5711 DUNHAM ROAD • BEDFORD, OHIO

For Hitting the "Pinpoint" from Five Miles Upstairs

Microhoning Provides Vital

High altitude bomb sights need a certain number of bearing surfaces of almost perfect precision accuracy and surface finish. The amazing accuracy of our bomb sights depends on this near-perfect accomplishment.

The thousands of these bomb sights needed made it necessary to achieve this fine instrument precision at production speed.

Ordinary machining practice can't produce such results—and fine instrument methods just aren't fast enough.

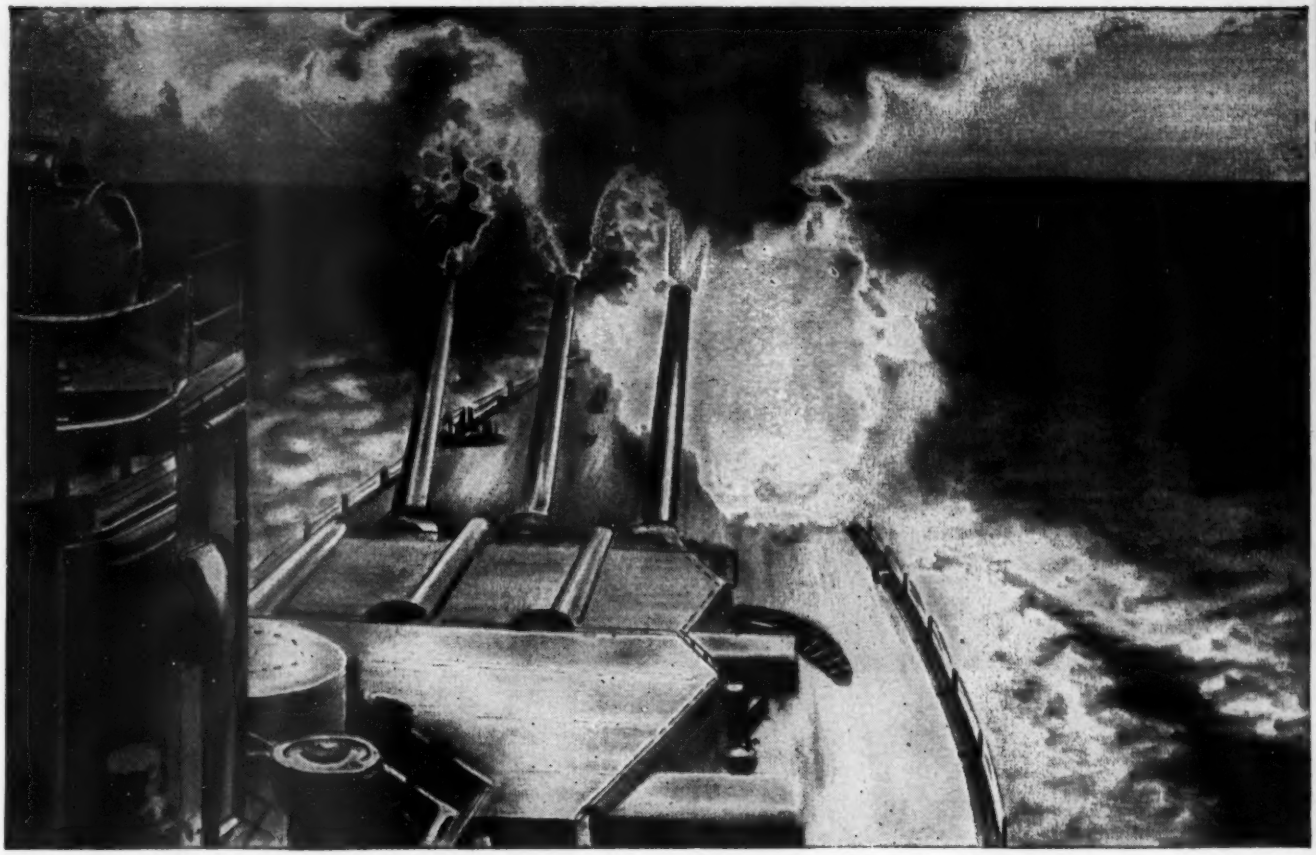
Microhoning bridged the gap. By means of this highly controlled abrading process, the extreme precision needed was obtained at production rates.

This modern final machining process will generate dimensional accuracy to "tenths" and fractions of "tenths", and provide any desired surface finish. It is applicable to the bores of these bomb sight bearings as it is to highly loaded gun turret bearings.

Precision Microfinish Honing will make many important contributions in postwar processing and Micromatic engineers will be ready with many new honing developments.

MICROMATIC
HONE CORPORATION
DETROIT 4, MICHIGAN

MAKERS OF HONING MACHINE TOOLS



. . . or Blasting a "Tin Can" Beyond The Horizon

Precision Bearings in Wartime Production

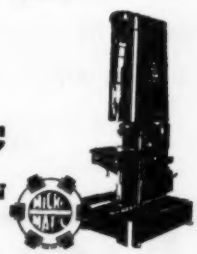
A battleship gun turret is a complex precision instrument on a gigantic scale. Each complete turret weighs about 1550 tons—as much as an entire medium weight destroyer. This great mass must not only move smoothly, but also very rapidly—guns must be quickly targeted with extreme precision and without backlash. That calls for something extraordinary in the way of bearings.

They must be dependable and have amazing accuracy. Inaccuracy or the slightest imperfection of operating fit would destroy the telescope precision needed to make each shot count.

The best ordinary machining methods won't provide the precision nor the fine surface finish necessary for accurate frictionless operation.

Microhoning was found to be the answer. Microhoning is a process of final machining which generates average bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour. In production of turret bearings—not only for battleships, but also for cruisers and destroyers—Microhoning has provided the desired combined precision and finish.

And, it will be more constructively useful in coming times of peace than it has been in war production.

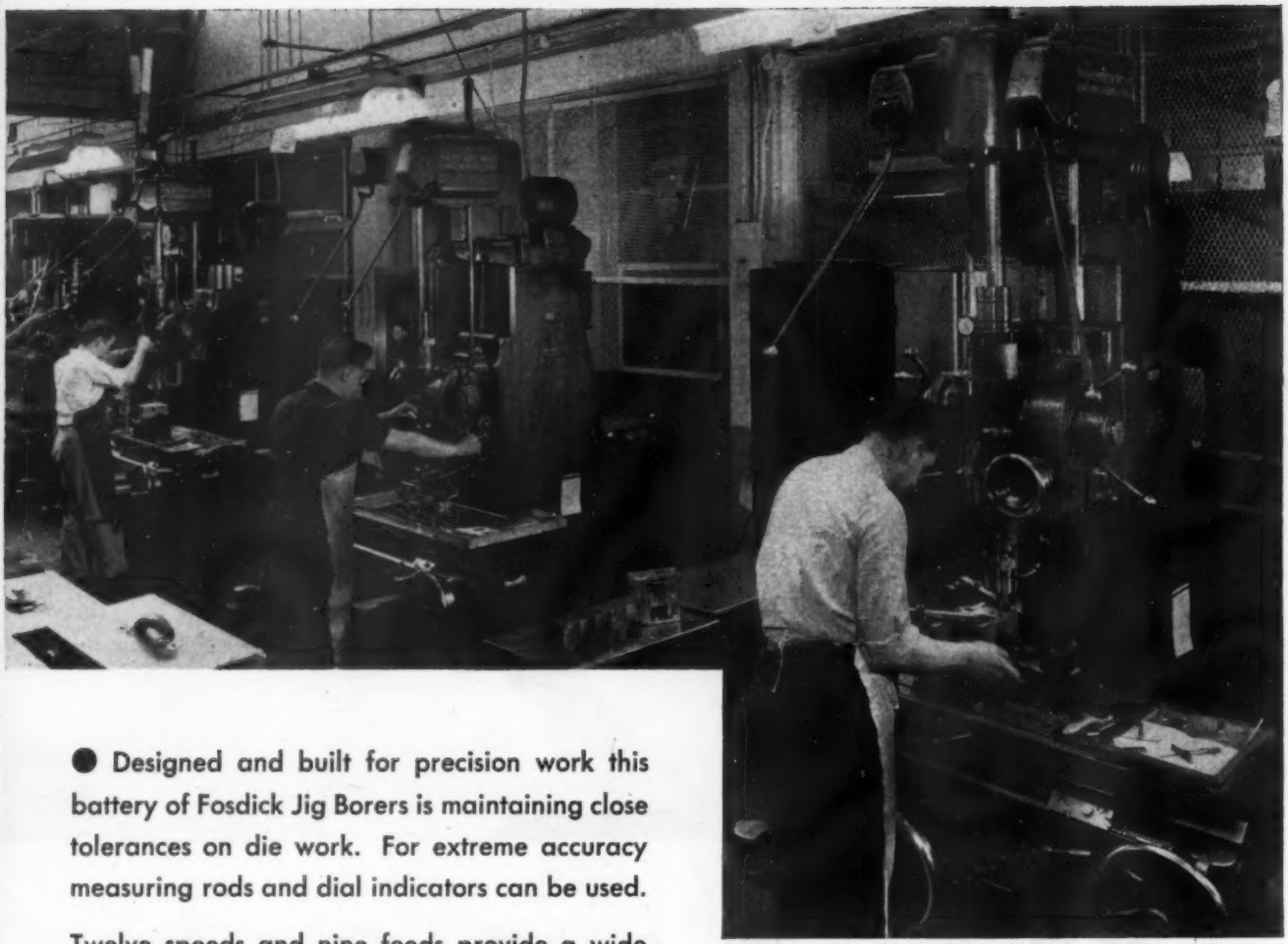


MICROMATIC

HONE CORPORATION

DETROIT 4 MICHIGAN

MAKERS OF HONING MACHINE TOOLS



● Designed and built for precision work this battery of Fosdick Jig Borers is maintaining close tolerances on die work. For extreme accuracy measuring rods and dial indicators can be used.

Twelve speeds and nine feeds provide a wide selection of feeds and speeds—centralization of all controls make for easy operation—graduated dial directly behind feed hand wheel permits feeding spindle by hand to predetermined depth by hand. These are but a few of the design and construction features that make for versatility and ease of operation.

Rigidity of construction from base up assures utmost in accuracy of work produced.

For ultimate economy and tool room precision put your jig borer work on a Fosdick Jig Borer.

The Fosdick Jig Borer J. B. A. contains complete details of construction and shows several typical jobs which illustrate its versatility.

Write for your copy.

A Battery of

FOSDICK

JIG BORERS

on Die Work

ARMY E NAVY

FOSDICK MACHINE TOOL COMPANY

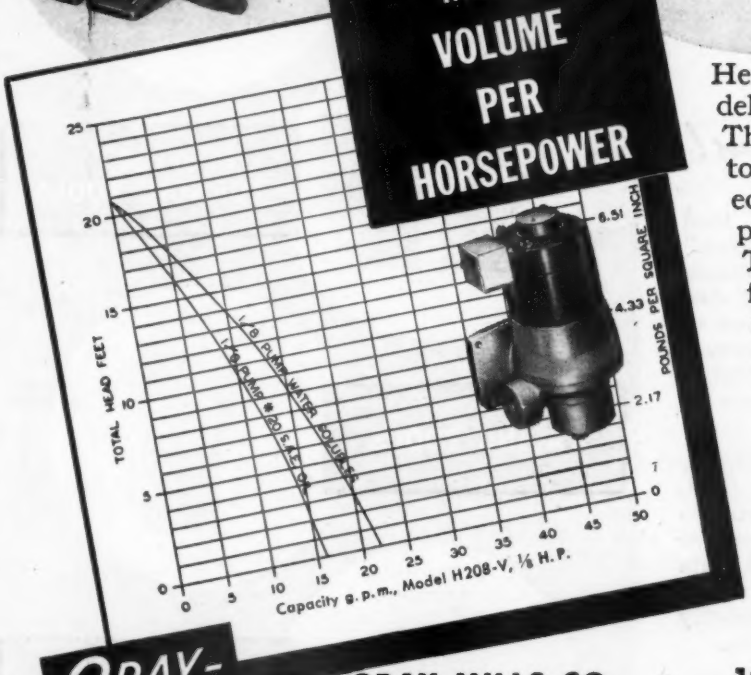
CINCINNATI 23, ··· OHIO

GRAY-MILLS
SUPERFLO CENTRIFUGAL PUMPS

FOR COOLANTS & LUBRICANTS

NEW!

MORE VOLUME PER HORSEPOWER



Here's a new line of centrifugal pumps that deliver *more volume per horsepower*. They are sturdy, dependable, compact, easy to install. Gray-Mills Superflo Pumps are economical to use, because they conserve power and operate with less maintenance. The flow can be regulated from a drip to a full stream without overloading the motor. Their advanced integrated design is an outward indication of built-in efficiency. Available with 1/25-⅛-¼ and ½ H.P. motors, in capacities from 9 to 75 gal. per min. There are models with floating impellers and special abrasion repulsion fans for fluids with high abrasive content. Replace your obsolete, worn pumps with new Gray-Mills' for greater efficiency. *Write for Bulletin.*

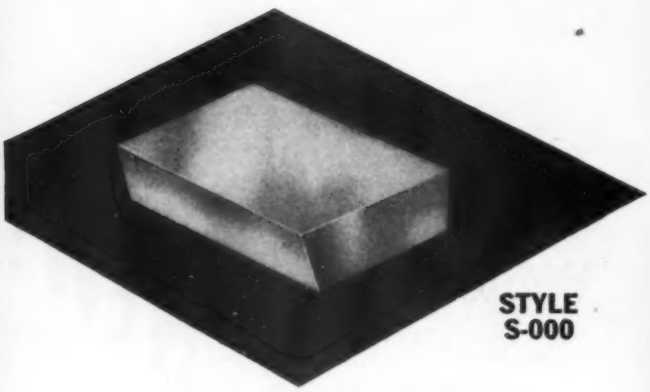
GRAY-MILLS

GRAY-MILLS CO. ★ 1953 RIDGE AVE., EVANSTON, ILL.

SUPERFLO CENTRIFUGAL PUMPS

PORTABLE COOLANT SYSTEMS, PORTABLE PUMPING UNITS, INDUSTRIAL FLUID REFRIGERATION, PARTS CLEANING SYSTEMS

New KENNAMETAL *"Universal"* BLANKS



STYLE S-000

FACILITATE TOOL MAKING

and Keep Stocks Down!

These new Kennametal "Universal" tool blanks are literally "jacks-of-all-trades." Rectangular in shape, with 12° clearance angle formed on one long edge, they can be used to make many different types of tools, simply by setting them into open-end recesses, as illustrated. They are available in all recognized standard sizes, many of which are stocked in several grades.

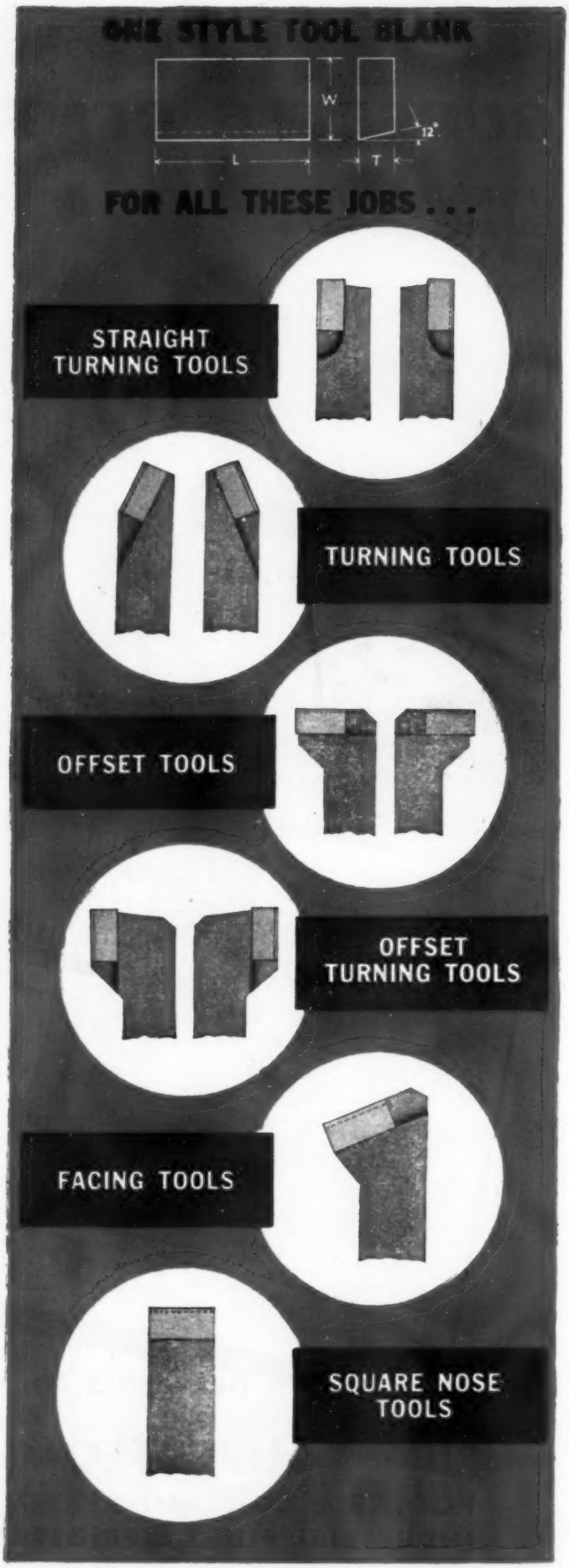
Their use reduces inventory investment, and simplifies stock room problems. And, above all, they make it easier for you to employ on a widespread, yet economical scale, the advantages of Kennametal—its ability to cut metal, including steel up to 550 Brinell hardness, accurately, at greatly increased speed, with amazing tool life.

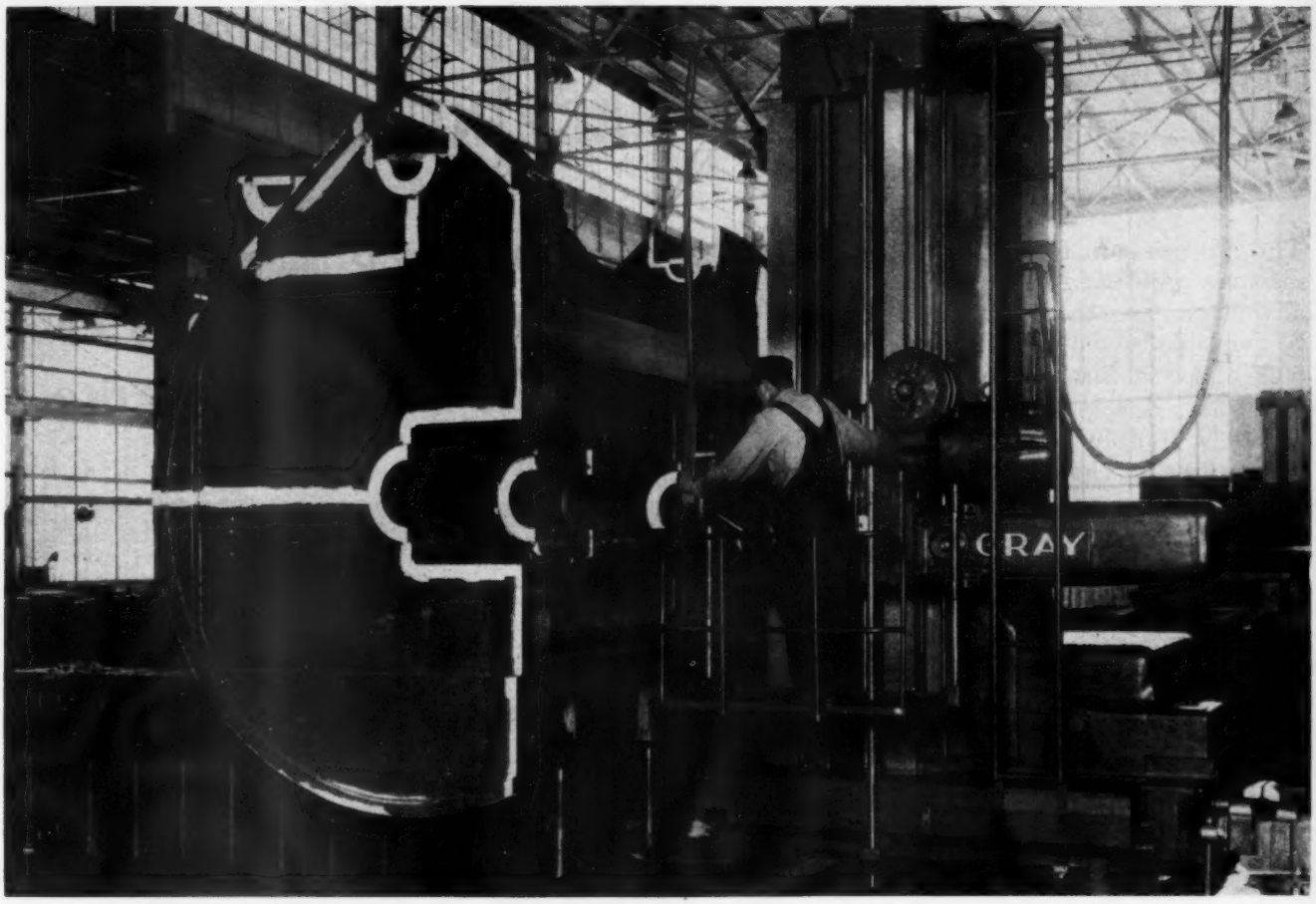
Catalog particulars, and prices, are yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

KENNAMETAL Inc., LATROBE, PA.





For large jobs requiring precision boring and milling

GRAY

Floor Type

BORING, DRILLING *and* MILLING MACHINE

● Here is a job which illustrates the extreme flexibility and ease of control of the Gray Horizontal Boring, Drilling and Milling Machine.

The convenient pendant switch gives him finger tip control of starting and stopping cutter—starting or stopping feed and rapid traverse from his normal operating position.

In this illustration the operator is milling a surface with an end mill by feeding the column along the runway. From this position on the platform he is close enough to get a full view of the cutter and work during milling operation.

This is but one of many jobs being handled on Gray floor Type Boring, Drilling and Milling Machines—easier—faster and at lower costs.

Bulletin No. 48—illustrates and describes this machine in detail. Write for one.

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U. S. A.

THE GRAY LINE—Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines.

Special-Purpose Machine Efficiency
at STANDARD MACHINE PRICE

The only reason for buying special machines is to gain special production advantages, yet, these advantages may be available to you at savings of up to 50% of special machine cost.

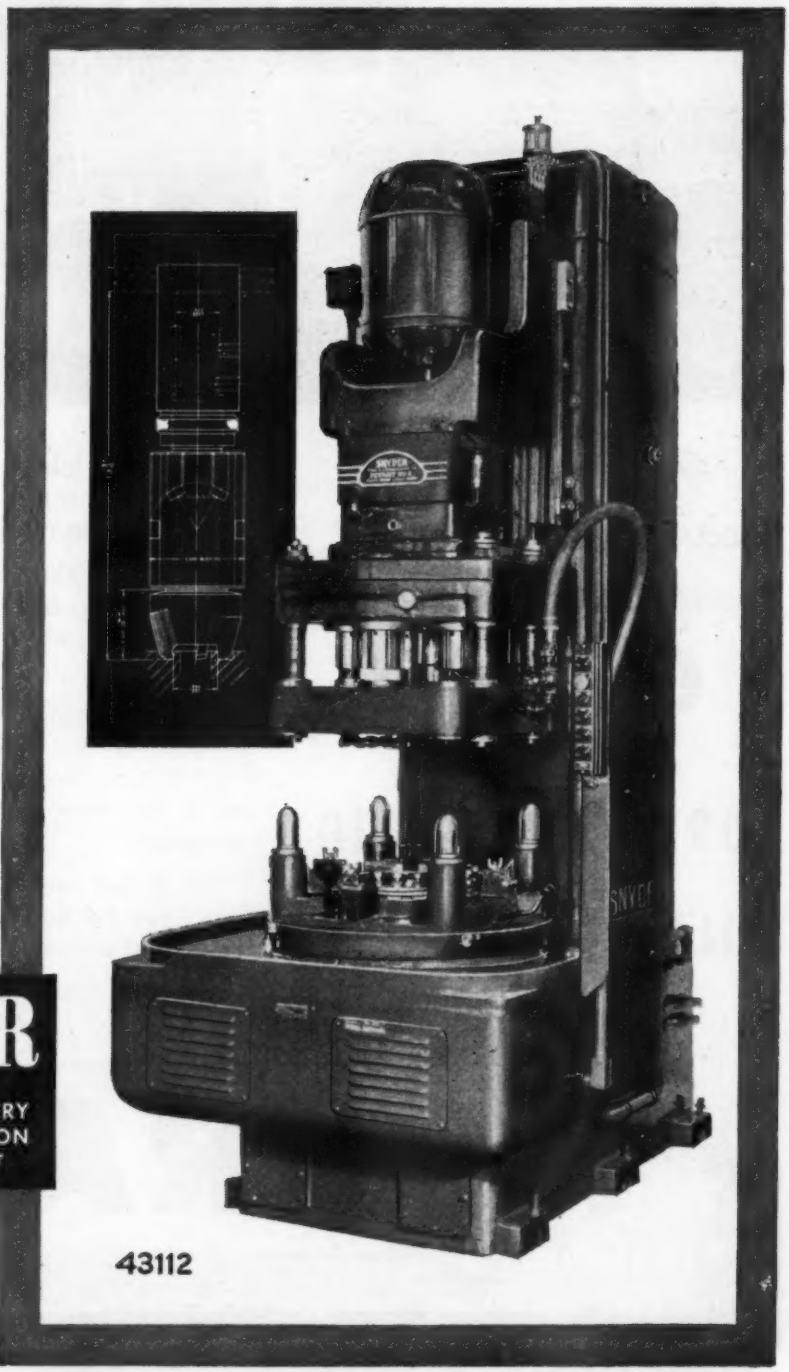
Here's an example. This Snyder standard 10 V 18 drilling machine is a general utility machine, yet, it can be adapted to do many jobs with "special machine" efficiency, speed, and economy of time and labor, through the use of special fixtures, heads and tools.

The machine shown is used to do a hollow milling job on 20 bosses, using a 5-spindle head and 4 indexes to complete the work cycle.

The index table housing serves as a chip trough and coolant retainer. The standard index mechanism provides the smooth acceleration and deceleration of the Geneva wheel, hydraulically powered from the hydraulic system of the machine itself.

This machine is available with or without special tooling and speed change transmission for single or multiple spindle adaptations. Only the equipment is special, and, with such equipment this machine is the equivalent of a special—at about half the cost of such a machine. This machine can be readily re-tooled for entirely different production by changing the special equipment only. If production is your problem, write, wire or 'phone *Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Michigan.*

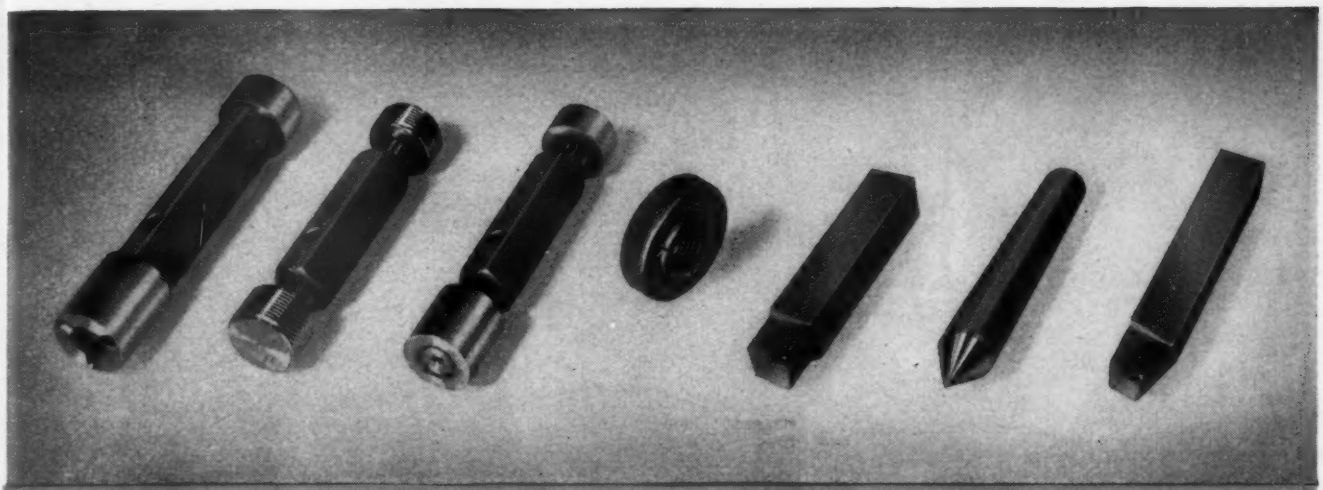
Snyder Standard Drilling Machine with Special Equipment Saves Up to 50% of Special Machine Price



43112

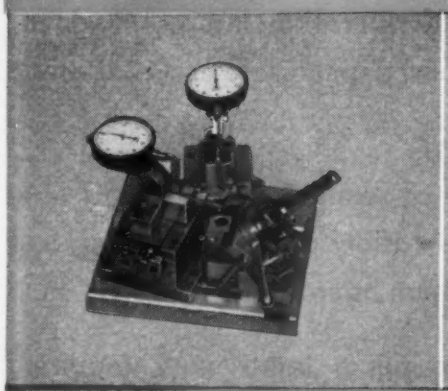
SNYDER
DESIGNERS AND BUILDERS OF MACHINERY FOR HIGH PRODUCTION AT LOW UNIT COST

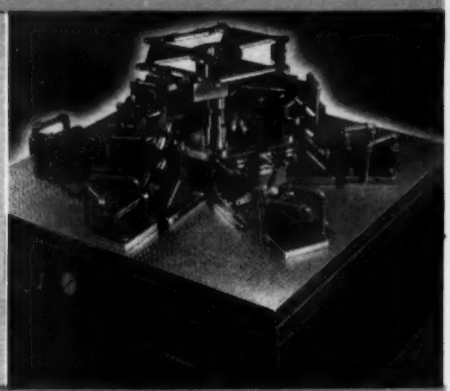
20 Years of Successful Cooperation with Leading American Industries



METRO'S experience is yours

Metro engineers and craftsmen know their tools and gages because they have for many years studied your requirements . . . studied jobs and the tools required to do them. Metro experience and "know-how", whether embodied in stock items or specially designed gages and tools for special needs, meet the most exacting requirements for precision and accuracy in YOUR production. Metro engineers will help you design special tools and gages to short-cut those tricky, troublesome jobs.





ARMY (E) NAVY

Metro Standard Gages and Carbide Tipped Tools are available for immediate delivery through your Metro distributor. Write today for Metro Catalog.

METRO

TOOL AND GAGE CO.

4240 Peterson Avenue

Chicago 30, Illinois

ACME TURRET LATHES

have the power, speed and accuracy for machining precision parts for* CARLTON *Radials

● Illustrated is a battery of Acme Turret Lathes at the Carlton Machine Tool Company plant.

The multiple tooling—rigidity of construction—ease of operation insures maximum production and dependable precision on all operations.

This battery of Acme Turret Lathes is handling a wide variety of turning, boring and similar precision operations.

If you have turret lathe work requiring special tooling, it will pay you to investigate Acme. Their long experience in "licking tough jobs" will be helpful to you in reducing costs and boosting production.

The ACME MACHINE TOOL CO. ... CINCINNATI 32, OHIO.

THREAD MEASURING WIRES

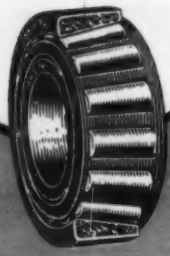
STANDARD EQUIPMENT EVERYWHERE

Van Keuren measuring wires are the accepted standard equipment for making measurements on thread gages, taps, worms, splines and spur gears. We carry a complete stock of sizes for measuring U. S. Standard, Whitworth, Metric, British Association, Pipe, Acme and 29° Worm threads. Special wires of any diameter in the range from .002" to 1.5708" are made to order. Our large supply of blanks insures prompt delivery.

Van Keuren thread measuring wires are manufactured to National Bureau of Standards specifications. They are hardened, ground and lapped by precision methods developed over a quarter-century. They are accurate within .00002" for roundness and straightness and within ±.000025" for size. Special sizes are made to any tolerance required.

It is easy to use Van Keuren wires. The Van Keuren handbook, — "Precision Measuring Tools" gives complete tables and simplified formulas for measuring all standard threads, splines and spur gears. Send for this valuable 160 page handbook No. 33.

25th YEAR



Tapered Roller TIMKEN BEARING EQUIPPED

the finishing touch of PRECISION

The DeVlieg Jigmil is truly representative of the finest traditions of American machine tool design and manufacture. From base to top it is a splendid example of American ingenuity and thoroughness.

In any spindle-operated machine, the ultimate objective of performance is the spindle nose; every other part of the machine is contributory to this. Here is the focal point of precision; what happens at this point determines the real value of any spindle-operated machine, be it a lathe, boring machine, milling machine, drilling machine or grinder.

Like so many other far-sighted heavy-duty machine manufacturers, DeVlieg Machine Company puts the finishing touch to precision by mounting their Jigmil spindles on Timken Tapered Roller Bearings. That is an assurance of fast, accurate performance now and for years to come. The Timken Roller Bearing Company, Canton 6, Ohio.

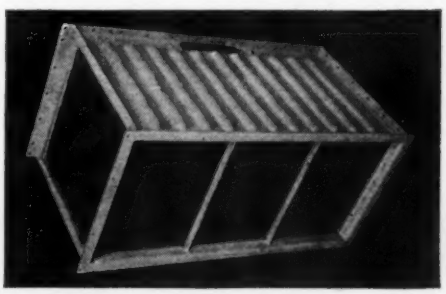
Make sure the trade-mark "TIMKEN" appears on every bearing you use.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

• These "envelopes" of Alcoa Aluminum brazing sheet are automatically formed and folded so that they slip together to build up the heat exchanger shown below. Dip brazing, an operation requiring only a few minutes, then joins them and the housing into a rigid, gas-tight unit.

When the dip-brazing method of assembly replaced the original gas-welding method, assembly time was cut to a mere fraction.

Many manufacturers have discovered new economies with Alcoa Aluminum brazing sheet and the brazing process. Our engineers will gladly help you fit both into your products. ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh 19, Pa.



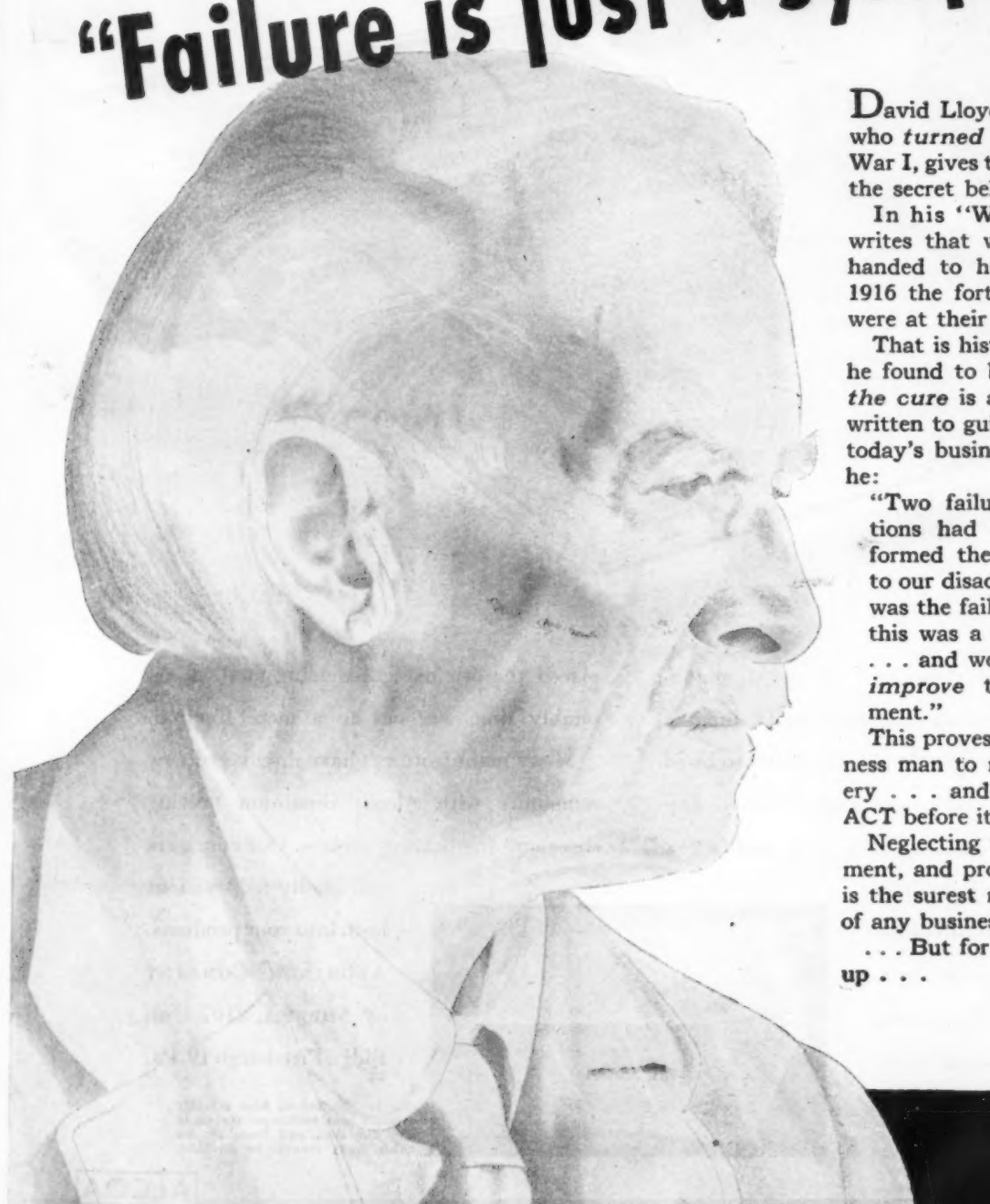
McQuay, Inc., Minneapolis, engineered, developed, and manufactures the Boeing B-17 Flying Fortress' secondary cabin heat exchanger. Heated air from primary exhaust heat exchanger travels in one direction, and fresh air for cabin heat travels in another.

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM

then he said to himself

"Failure is just a symptom"



David Lloyd George, the man who *turned the tide* of World War I, gives to postwar planners the secret behind that turn.

In his "War Memoirs" he writes that when the war was handed to him at the end of 1916 the fortunes of the Allies were at their lowest ebb.

That is history . . . but what he found to be *the cause* and *the cure* is as fresh as though written to guide the strategy of today's business planners. Says he:

> "Two failures on key questions had completely transformed the military position to our disadvantage. The first was the failure to realize that this was a war of machinery . . . and we had neglected to *improve* the Allied equipment."

This proves he is a good business man to make that discovery . . . and a better man to ACT before it is too late.

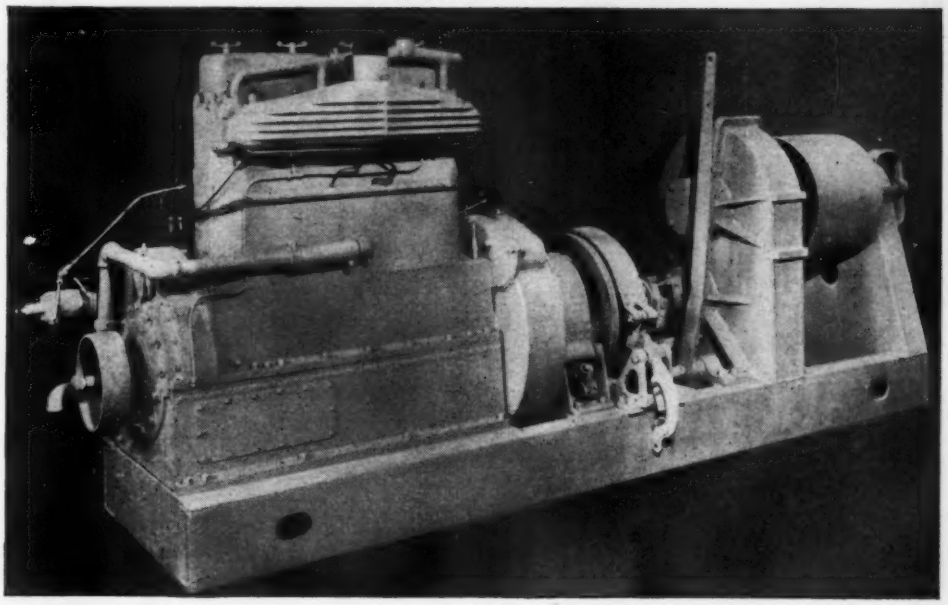
Neglecting to improve equipment, and production, and cost is the surest road to the valley of any business curve.

. . . But for climbing out, and up . . .

"IMPROVEMENT...the key," *he says*

Look, "L. G.," how recourse to Welded Design improves the product and cuts its cost . . . provides the key to a stronger competitive position:

10% LOWER COST



. . . 25% Lighter . . . with Welded Design

Product: Four cylinder gas or gasoline engine, for oil field drilling, designed and manufactured by Buffalo Gasoline Motor Co., Buffalo, N. Y. Changeover to welded design resulted in these improvements:

10% Lower Cost. Saves materials. Eliminates operations. Reduces machining. Saves factory space. Overall savings 10%.

25% Less Weight. Simplifies transportation and installation in rough oil field terrain . . . reduces hauling time and increases drilling time.

Durable. Strong, welded steel construction withstands severe field service. Engines are operating continuously 24 hours per day for periods as long as 60 days.

Faster Changes. Designs can be improved easily, quickly, cheaply with standard materials and existing production equipment.

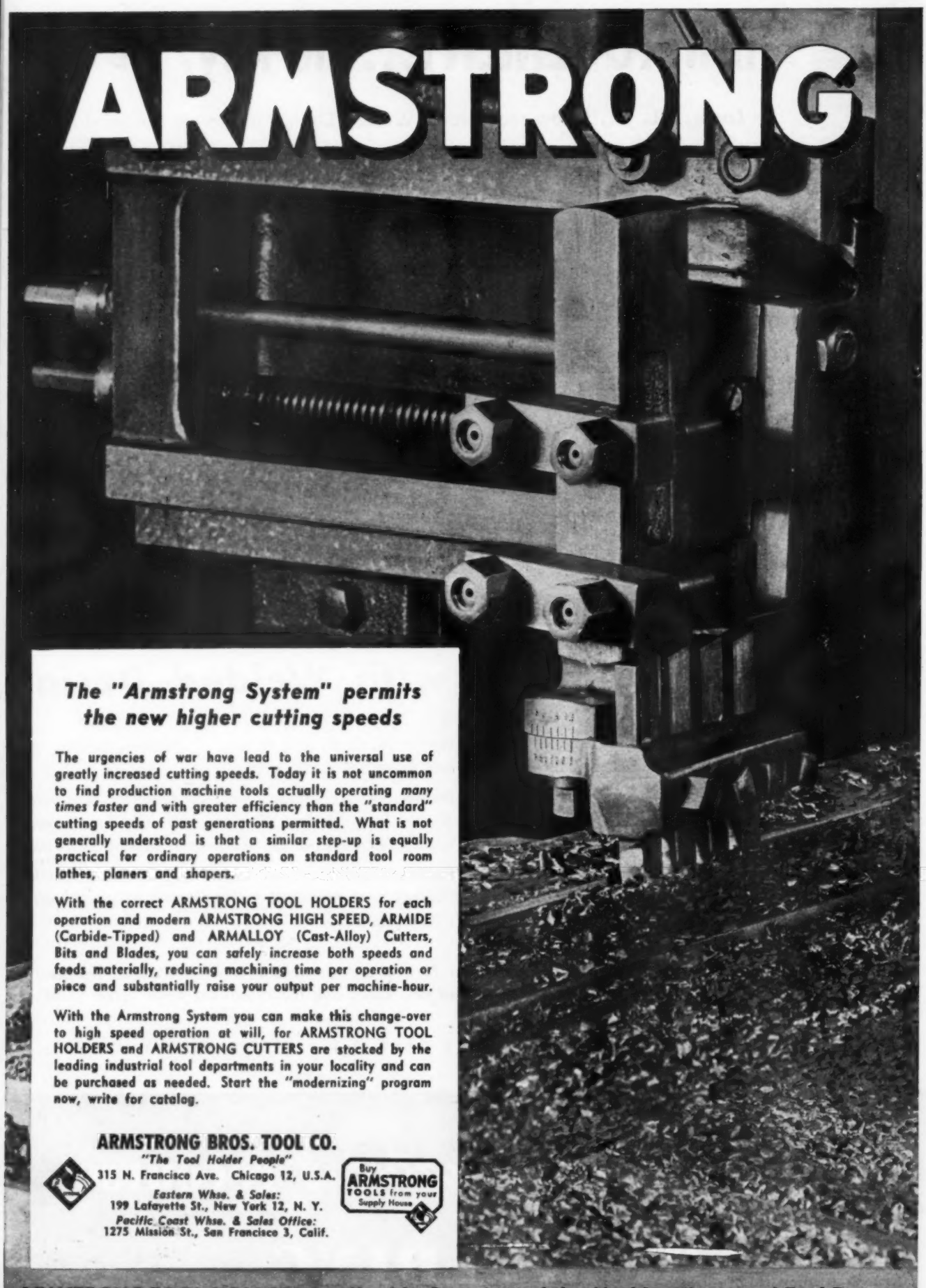
The Lincoln Engineer nearby will gladly help you improve your products with Welded Design. Machine Design Application Sheets will be mailed you free; ask for them on your letterhead.

THE LINCOLN ELECTRIC COMPANY • DEPT. I-1 • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

ARMSTRONG



The "Armstrong System" permits the new higher cutting speeds

The urgencies of war have lead to the universal use of greatly increased cutting speeds. Today it is not uncommon to find production machine tools actually operating *many times faster* and with greater efficiency than the "standard" cutting speeds of past generations permitted. What is not generally understood is that a similar step-up is equally practical for ordinary operations on standard tool room lathes, planers and shapers.

With the correct ARMSTRONG TOOL HOLDERS for each operation and modern ARMSTRONG HIGH SPEED, ARMIDE (Carbide-Tipped) and ARMALLOY (Cast-Alloy) Cutters, Bits and Blades, you can safely increase both speeds and feeds materially, reducing machining time per operation or piece and substantially raise your output per machine-hour.

With the Armstrong System you can make this change-over to high speed operation at will, for ARMSTRONG TOOL HOLDERS and ARMSTRONG CUTTERS are stocked by the leading industrial tool departments in your locality and can be purchased as needed. Start the "modernizing" program now, write for catalog.

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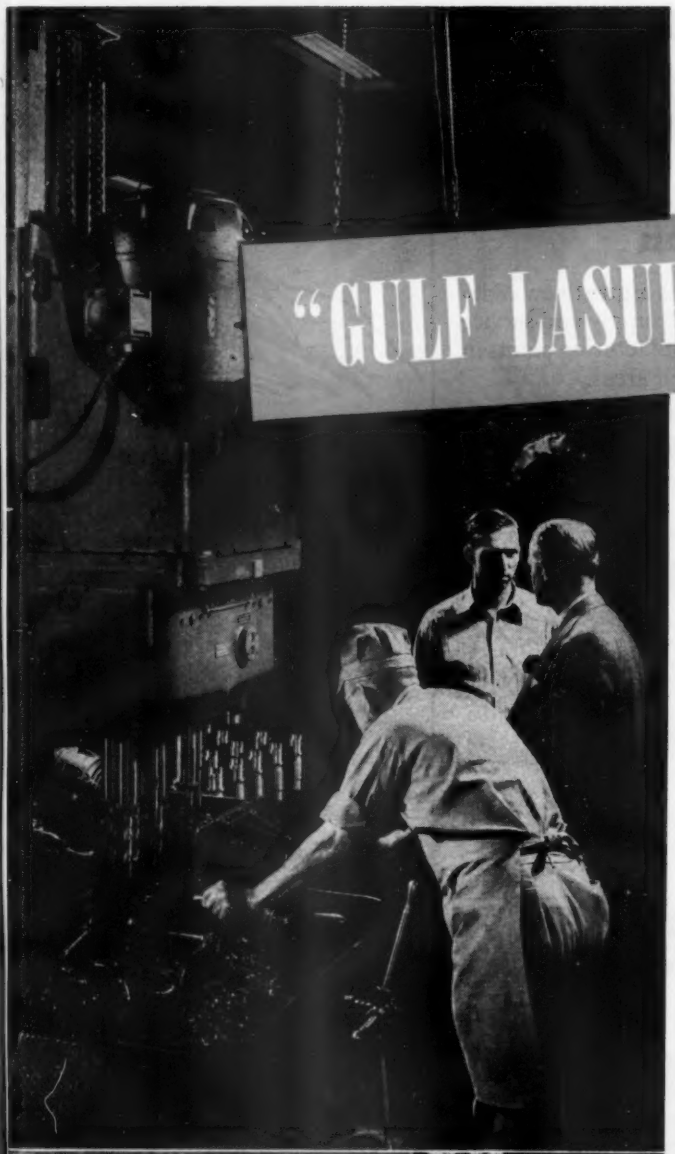
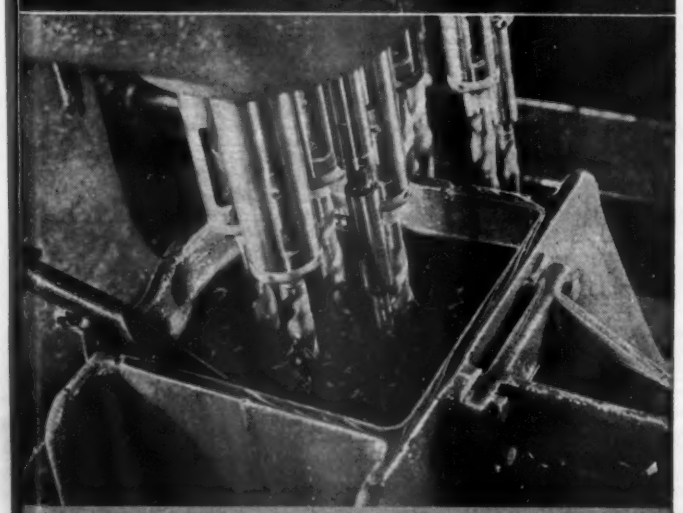
ARMSTRONG TOOL HOLDERS Are Used In Over 96% of the Machine Shops and Tool Rooms





(Above) Actual photo of a Gulf Service Engineer (right) consulting with Foreman on results with Gulf Lasupar Cutting Oil in drilling master connecting rods for aircraft engines. *(Below)* Close-up of drilling operation.

"GULF LASUPAR CUTTING OIL

helped us increase production 15% _____ tool life over 100%"

says this aircraft motor plant Foreman

WE GET BETTER RESULTS with Gulf Lasupar Cutting Oil than with any other cutting fluid we have tried for drilling master connecting rods," says this Foreman. "Lasupar helped us step up production 15% and tool life over 100%."

Here is a cutting oil that may be the answer to your tough, hard-to-speed-up machining operations—and to your requirements for an exceptionally fine finish on the work. Gulf Lasupar Cutting Oil has set new standards of performance for tough jobs in hundreds of aircraft, armament, and munitions plants.

And war production reports on Gulf Lasupar have a peacetime value: This performance-proven cutting oil can give important help to shops seeking lower unit production costs for postwar business!

Gulf Lasupar Cutting Oil—and the other quality cutting oils in Gulf's complete line—are available to you through 1200 warehouses located in 30 states from Maine to New Mexico. Write, wire, or phone your nearest Gulf office today.

GULF INDUSTRIAL LUBRICATION

GULF OIL CORPORATION
GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH 30, PA.

How UP-TO-DATE are

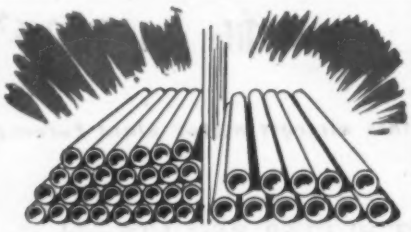
REYNOLDS: Answer to Industry's No. 1 Question

Today . . . With R301 and the other new high-strength alloys, aluminum combines light weight, corrosion-resistance *and great strength* . . . extends farther and farther the rapidly widening field of its usefulness.

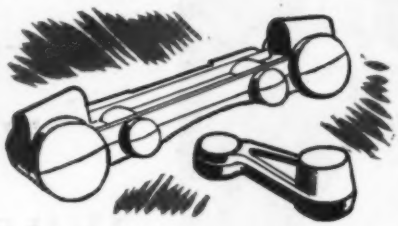
Today . . . To known prewar facilities Reynolds adds a great new independent source of supply and service . . . mines . . . manufacturing plants in the great industrial areas.

Never again need America face the danger of aluminum scarcity and high prices.

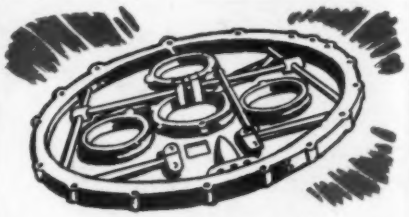
Sheet and Plate. Standard gauges, sizes and alloys. Many special items.



Tubing. Seamless. Closely controlled as to quality and dimensions.



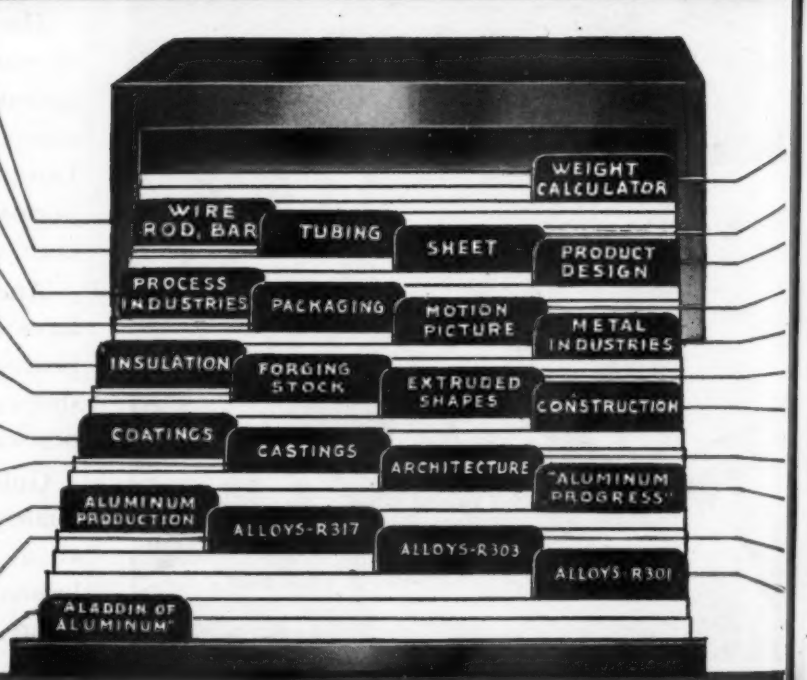
Forgings. Production capacity—up to 2,000,000 units per month.



Castings. Permanent mold and sand. Produced in one of industry's most modern plants.

BULLETINS ... CATALOGS ... OTHER MATERIAL ...

1. **Wire, Rod, Bar.** (Bulletin 31-A.) Specifications, ordering data, etc. 12 pages.
2. **Tubing.** (Bulletin 17-A.) Specifications, ordering data, etc. 8 pages.
3. **Process Industries.** "Reynolds Aluminum, its New Importance in Processing Operations." (Catalog 102.) 8 pages. (Now on press.)
4. **Packaging.** Bulletin on protective metal packaging for military and civilian application, 4 pages.
5. **Insulation.** Bulletin on types and applications of reflective metal insulation.
6. **Forging Stock.** (Bulletin 23-A.) Ordering data. 8 pages.
7. **Coatings.** Forms, applications, evaluation, etc. Powders and Pastes. (Bulletin 21-A.) 20 pages.
8. **Castings.** Descriptive bulletin of Reynolds facilities for sand and permanent mold castings. (On press.)
9. **Aluminum Production.** "From Bauxite to Rolled Metal," story and flow diagram of world's only complete aluminum plant. 8 pp.
10. **Alloys—R317.** A new free machining strong aluminum alloy.
11. **"Aladdin of Aluminum."** A Reader's Digest reprint, giving background story of Reynolds growth.



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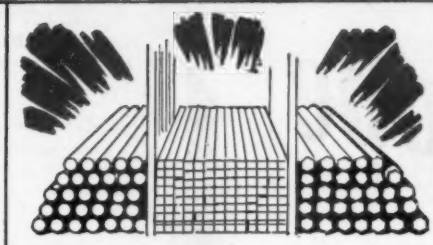
REYNOLDS ALUMINUM

The Great New Source of

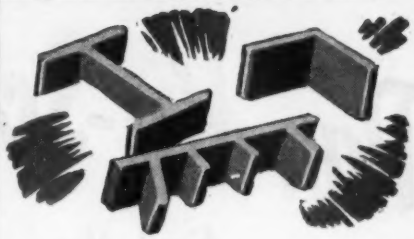
INGOT • SHEET & SHAPES • WIRE • ROD & BAR • TUBING • FOIL • EXTRUSIONS • CASTINGS • TOOL • POWDER

you on ALUMINUM?

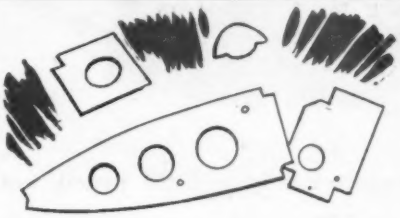
Wire. Cross-sections less than ⅜ inches. Also finished rivets.



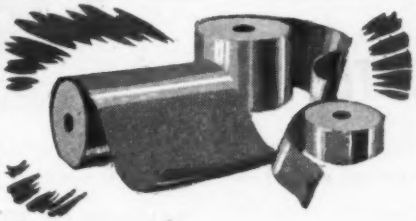
Rod and Bar. Sizes from ⅜ inches to 8 inches for forging and machining.



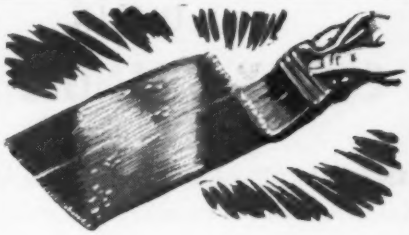
Shapes. Rolled and extruded sections to fulfill individual needs.



Parts. Fabrication at aluminum source saves manpower, plant space, scrap and transportation.



Foil. For years the largest producer of light gauge aluminum for packaging, technical and insulation purposes.



Powders and Pastes. For aluminum coatings.

CONCISE, AUTHORITATIVE

12 **Weight Calculator.** Slide rule for determining weights of all commonly used metals.

13 **Sheet.** (Bulletin 22-A.) Specifications, ordering data, etc. 8 pages.

14 **Product Design.** "Reynolds Aluminum, its Important Role in Tomorrow's Products." (Catalog 100.) 16 pages.

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16 **Metal Industries.** Cond. Catalog of Reynolds products and services for Metal-Working Industries. Properties, applications. 8 pp.

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"Reynolds Aluminum, its Important Role in Tomorrow's Products," is of direct interest to every one concerned with design and production. 16 pages packed with useful information. Check 14... in coupon at right.

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To the sum total of metallurgical knowledge Reynolds Metals has added much vital data . . . experience gained in pioneering new fields of aluminum production and product development—the use of improved machines and processes in the world's largest mills—the creation of new alloys, promise of even greater things to come.

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Much technical material is available upon request. Check the catalogs and bulletins desired. Write in detail concerning any special question. Reynolds Metals Company, Aluminum Division, 2523 S. Third Street, Louisville 1, Ky.

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Put your plans for peacetime products through the

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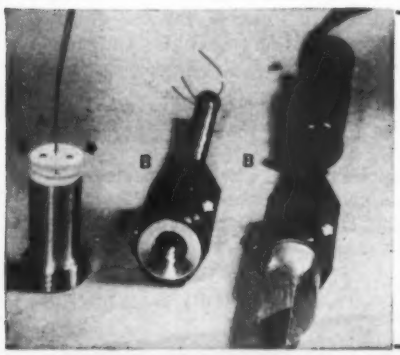
find the "FASTENING BUGS" *NOW* avoid COSTLY CHANGES *LATER*

LENS of the "Par-Ka-Scope" is the eagle eye of a Parker-Kalon Assembly Engineer. He can help you focus on the "fastening bugs" that usually hide out until you are all set up for production, then start running up costs.

THE "BUGS" may be needless tapping, slow bolt-and-nut assembly, costly inserts in plastics that slow up molding, riveting in hard-to-reach places. Whatever they are, he'll help you find them now, when a changeover to the short-cut fastening method . . . with P-K Self-tapping Screws . . . requires only a little pencil work.

SAVINGS OF 30% to 50% are the common experience of thousands of manufacturers who have adopted this *short cut method of assembling metals or plastics.*

THE P-K ASSEMBLY ENGINEER'S advice is unbiased. He'll recommend only the best Self-tapping Screw for the job – Parker-Kalon makes *all* types. Tell us when you'd like him to call, or send details of fastening jobs for recommendations.



THIS MANUFACTURER FOUND A MILLION "TAPPING BUGS"... FIND YOURS NOW!

By switching to P-K Type "U" Drive Screws in assembly of Hexacon Soldering Irons, the Hexacon Electric Co., Roselle, N. J., eliminated a million tapping operations a year formerly needed for machine screws. Time saving is more than 25%. Fastening is better, stronger than when machine screws (and before that, taper pins) were used.

In application (B), the heads of the Type "U" P-K Screws are ground off after they are driven, making a permanent, tamper-proof fastening.

GET THIS GUIDE – IT'S FREE

The P-K "Users' Guide" describes all types of Parker-Kalon Self-tapping Screws, and tells where and how to use them. Arranged so you can find the facts you need quickly. Write for it. Parker-Kalon Corp., 208 Varick St., New York 14, N. Y.

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Quality-Controlled
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For Every Metal and Plastic Assembly

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Small tools — at the business ends of machines working to capacity — must be capable of making time, labor and material savings in order that production demands be met. UNION TOOLS are meeting such demands in the countless plants turning out war materiel. They are saving time by faster cutting — saving labor by requiring less resharpening — conserving material by assuring accuracy and minimizing spoilage.

The ability of UNION TOOLS to make savings is traceable to an in-built fineness of quality which in turn is the result of UNION'S long, specialized experience in small tool development.

For the sake of savings, it will pay you to standardize on UNION.

Twist Drills — Milling Cutters — Reamers — Hobs — Slitting Saws — End Mills — Taps — Dies — Screw Plates — Profile Cutters.

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TWO SEPARATE OPERATIONS.....
IN THE TIME REQUIRED FOR ROUGH MILLING — *ALONE*!

The NEWTON MILL-N-SHAVER

COMBINATION UNIT HEAD MILLING AND SHAVING MACHINE EQUIPPED WITH TWO SINGLE VERTICAL MILLING HEADS AND TWO FINISH SHAVING HEADS. HYDRAULIC FEED TO TABLE.

The Newton Mill-N-Shaver performs two complete operations at one pass of the table. It rough mills at milling speed and finish shaves on the return, at the rapid traverse speed. This machine produces a perfect gasket surface . . . two separate operations . . . in exactly the time ordinarily required for rough milling alone. The Newton Mill-N-Shaver is designed to both step-up your production and reduce your costs on the types of work for which this machine is adapted. For detailed information, write for Bulletin No. 580.

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ROCHESTER 10, NEW YORK

"Orchids" from an Exacting Customer

Following is excerpt from an unsolicited letter from a prominent airplane engine manufacturer:

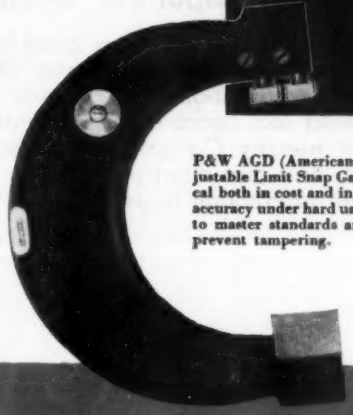
"Subject gages are definitely the best quality in precision workmanship of any of this type received to date. The precision-lapped finish of gaging jaws and center block details is exceptional, and is comparable to gage size blocks for quality of finish and tenacity in wringing. The error in parallelism of center block is negligible.

"Trusting that we may continue to receive products of such high quality from your company."

. . . for P&W Snap Gage Accuracy!

It's not easy to earn praise such as the letter above. But consider — P&W Adjustable Limit Snap Gages have frames of high grade, close grained grey iron, seasoned to assure stability. The easily adjustable anvils of finest tool steel are heat-treated, lapped flat and square with shank — provide maximum bearing, longer wearing surface, unsurpassed *accuracy*. Easy to handle, even for unskilled operators, these gages provide a check for maximum and minimum diameter in one single hand motion. In every way, P&W Adjustable Limit Snap Gages are a paying investment. Circular giving full particulars will be mailed upon request.

P&W Trusform Adjustable Limit Snap Gage features lightness, great strength and rigidity. Its bakelite grip insulates gage from heat of operator's hand. It will produce the lowest cost per piece gaged on any job for which it is suitable.



P&W AGD (American Gage Design) Adjustable Limit Snap Gage is very economical both in cost and in use, will retain its accuracy under hard usage. It is easy to set to master standards and can be sealed to prevent tampering.

Ideal for the limit system wherever there are diameters or lengths to be checked, P&W Adjustable Limit Snap Gages are easily adjustable and feature positive anvil locking to guarantee unchanging accuracy.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

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Here's your 3-step plan for

BETTER TOOLS TO CUT PRODUCTION COSTS!

Use this sure way to knock the props from under production costs. Let Carpenter help you put this three-step plan to work in your tool room and heat treating department. With it you can reduce machine down-time and actually lower unit costs.

1. Cut The Cost Of Tooling-Up And Reduce Machine Shut-Downs!

It's no trick at all to make sure of selecting the proper tool steel for each job when you use the Carpenter Matched Set Method. Many plants use this method of selection to lick production problems caused by premature tool and die failure. And it works! Now tool makers who have used it are relying on it to get *every* job done right. They know it cuts the cost of tooling-up and reduces machine shut-down time. And those savings are bound to show up in the cost of the finished product.

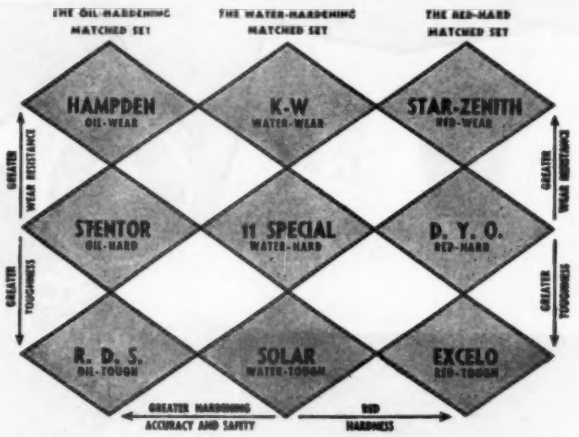
2. Insurance That Each Tool Will Pay-Off On The Job!

As you know, proper heat treatment is the second step to seeing that each tool is made to do its job right. And the Carpenter Heat Treating Guide quickly gives you this important information about each Carpenter Matched Tool Steel: Type analysis, Forging heat, Normalizing heat, Annealing treatment, Hardening treatment and Recommended drawing range. And this slide chart gives you tips on quenching, oxidizing atmospheres, heating time and heating speed for drawing. For your free copy, drop us a note on your company letterhead.

3. Check On Tool Life And Output Per Grind!

Find out which tools and dies need too frequent regrinding or fail prematurely in service. Carpenter Matched Tool Steels can help you lick this condition, and reduce unit costs. And for personal help in your tool room or heat treating department, get in touch with your nearby Carpenter representative. He knows tool steel inside-out, and can often provide the kind of engineering help that licks tough production bugs.

The Standard Tool Steels of Industry



How The Carpenter Matched Set Method Helps To Solve Your Tool Steel Problems

These are really Matched Tool Steels, as one picks up its job where the other "leaves off."

The key steel is the one in the center, *No. 11 Special,* a straight carbon, tough timbre, water-hardening tool steel. When you have a tool to make, you first find out if it can be made from *No. 11 Special.* If the answer is "Yes", you go no further. But when the answer is "No", you use the diagram to point the way to the tool steel that will do the job. For greater *wear resistance,* you go north. For greater *hardening accuracy* and *safety,* you move west. Just follow the diagram.

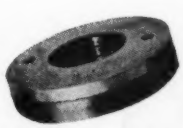
To learn more about the ways this method can be used in solving *your* special problems, ask for a copy of the 167-page Carpenter Matched Tool Steel Manual. It contains an 80-page tool index and steel selector that many tool engineers find extremely handy. For your copy, write us a note on your company letterhead, indicating your title. (Free to tool steel users in U. S. A.)

RESULTS that show how the Carpenter Matched Set Method can boost plant output and cut costs all along the line:

A STAKING PUNCH

only lasted about 40 hours until this method pointed the way to the proper Carpenter Matched Tool Steel for the job. With No. 11 Special, punch life jumped from 40 hours to over 6 months of service.

A SHAVING DIE



failed after 99,600 pieces were produced as it wore too rapidly. Then this method indicated Hampden for maximum wear resistance and hardening accuracy. Production per die jumped over 500%!

COINING PUNCHES

for forming bearing races from 1015 steel failed after running a half-day. The Diagram pointed to the greater toughness of Solar. Result: 250% more production per punch—and 48 fewer tools to make each month.

THE CARPENTER STEEL COMPANY • 109 W. BERN STREET • READING, PA.

Carpenter MATCHED TOOL STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

GIDDINGS & LEWIS

138 DOTY STREET

Right: G. & L. Table Type Machine.

Right: G. & L. Floor Type Machine.

200 Practical Engineers at your service!

Nearly 200 practical engineers in G. & L. dealer organizations are ready to help you solve your production machining problems. They welcome the opportunity to furnish you with complete information on the type and size G. & L. Horizontal Boring, Drilling and Milling Machines best suited to your needs. A telephone call or letter to the nearest Giddings & Lewis dealer, or to our district representative, will bring you the helpful information you desire.

G. & L. Direct Sales and Service Representatives

We have established four regional offices for G. & L. sales and service engineers to supplement our dealers' efforts. Do not hesitate to call them direct in an emergency.

D. M. Laflin
405 Lexington Avenue
New York 17, New York
Murray Hill 6-9161

Home Address:
22 Cornell Street
Scarsdale, New York
Larchmont 2-3694

A. E. Ulrich
2842 West Grand Blvd.
Detroit 2, Michigan
Madison 2830

Home Address:
285 Hawthorne Road
Birmingham, Michigan
Birmingham 3786

H. S. Peters
1699 Van Ness Avenue
San Francisco 9, California
Tuxedo 6000

Home Address:
1320 Burbank Street
Alameda, California
Lakehurst 2-7121

Ira P. Mabie
571 Washington Blvd. at Jefferson
Chicago 6, Illinois
Randolph 8860

Home Address:
2000 Lincoln Park West
Chicago, Illinois
Diversey 1389

Our engineers are ready to assist you in adapting war surplus Giddings & Lewis equipment to your needs.

This is your directory of G. & L. representatives . . . tear it out for handy reference.

Also make use of the G. & L. Library of Factual Information . . . shown on the opposite page.

American Machinery & Supply Co.
1113 Howard Street
Omaha 8, Nebraska

Anderson Machine Tool Co.
2645 University Avenue
St. Paul 4, Minnesota

R. S. Armstrong & Bros. Co.
676 Marietta Street, N. W.
Atlanta 3, Georgia

C. H. Briggs Machine Tool Co., Inc.
Onondaga Hotel Building
Syracuse, New York

Briggs-Weaver Machinery Co.
109 North Market Street
Dallas 2, Texas

Dawson Machinery Company
2737 First Avenue South
Seattle 4, Washington

Jos. F. Dohan
P. O. Box 1154
New Orleans 4, Louisiana

Harry M. Euler Co.
125 S. W. First Avenue
Portland 4, Oregon

Farquhar Machinery Company
720-728 West Bay Street
Jacksonville 3, Florida

Harrington-Wilson-Brown Co.
405 Lexington Avenue
New York 17, New York

Have Machine Tool Co.
269 South Front Street
Memphis 2, Tennessee

Hendrie & Bolthoff Mfg. & Supply Co.
1635 Seventeenth Street
Denver, Colorado

George Keller Machinery Co.
1807 Elmwood Avenue
Buffalo 7, New York

The E. A. Kinsey Company
331-335 West Fourth Street
Cincinnati 2, Ohio

725 North Capitol Avenue
Indianapolis 4, Indiana

938 Cleveland Avenue
Columbus 3, Ohio

11 West Monument Bldg.
Dayton 2, Ohio

Marshall & Huschart Machinery Co.
571 Washington Boulevard at Jefferson
Chicago 6, Illinois

Moore Machinery Company
1699 Van Ness Avenue
San Francisco 9, California

3876 Santa Fe Avenue
Los Angeles 11, California

Motch & Merryweather Machinery Co.
West Third and Lakeside Avenue
Cleveland 13, Ohio

2842 West Grand Boulevard
Detroit 2, Michigan

717 Liberty Avenue
Pittsburgh 22, Pennsylvania

McVoy-Hausman Company
2024 Sixth Avenue North
Birmingham 3, Alabama

Sam H. Penny, Machine Tools
P. O. Box 1271
Houston, Texas

The Salt Lake Hardware Co.
105 North 3rd Street West
Salt Lake City 9, Utah

Robert R. Stephens Machinery Co.
3615 Olive Street
St. Louis 8, Missouri

Swind Machinery Company
Broad Street Station Building
Philadelphia 3, Pennsylvania

5300 York Road
(Govan P. O.)
Baltimore 12, Maryland

256 Harding Court
York, Pennsylvania

Tidewater Supply Company, Inc.
P. O. Box 839
Norfolk 1, Virginia

Wigglesworth Machinery Company
199 Bent Street
Cambridge 41, Massachusetts

Canada Machinery Corporation, Ltd.
Galt, Ontario, Canada

Montreal, Quebec

Toronto 2, Ontario

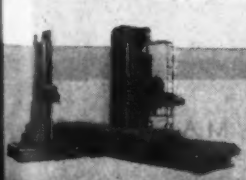
Vancouver, British Columbia

Calgary, Alberta

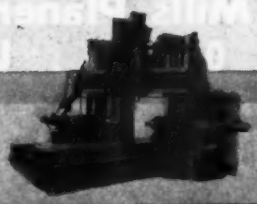
Halifax, Nova Scotia

MACHINE TOOL CO.

FOND DU LAC, WIS.



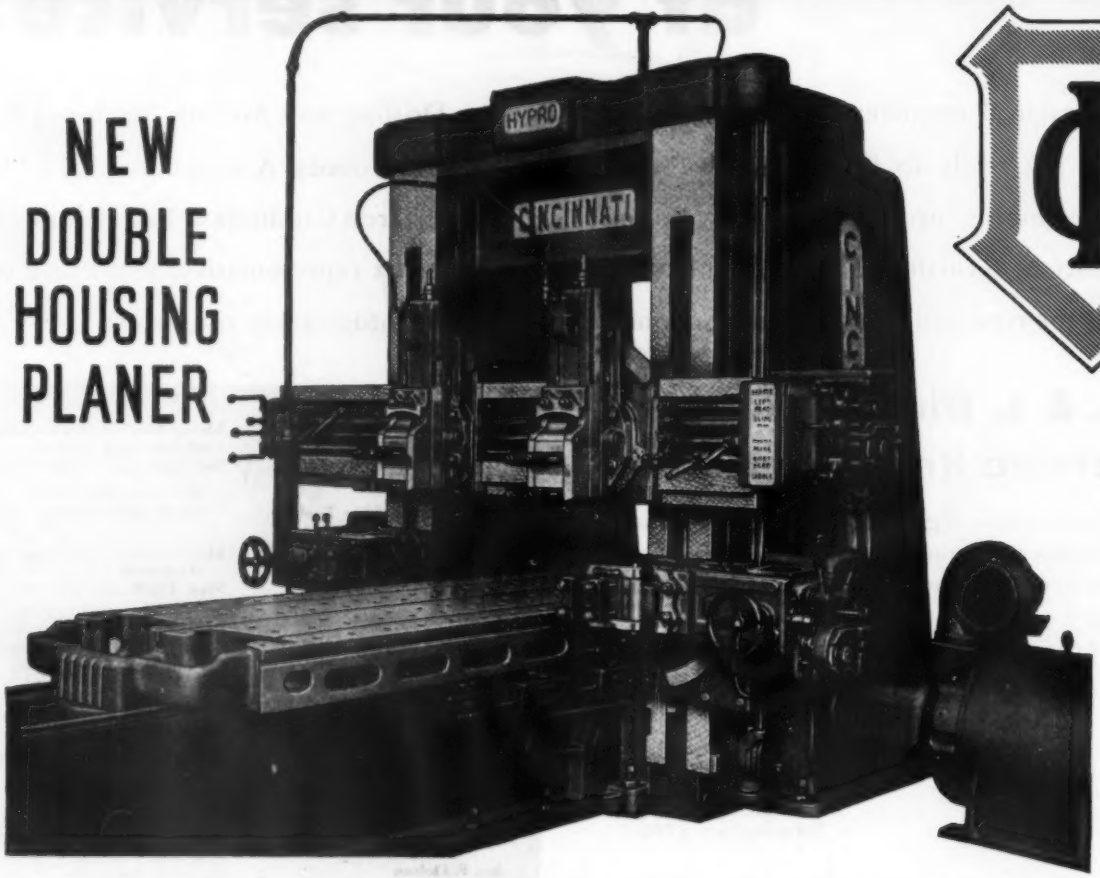
Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

CINCINNATI HYPRO

NEW DOUBLE HOUSING PLANER



BETTER PLANING FOR LESS COST
At speeds up to 300 feet per minute

This newly designed Cincinnati Hypro Double Housing Planer is just as sturdy as it looks. Its massive pyramid housings, its liberal dimensions and well built components assure the rigidity necessary for accurate planing.

This 48" planer is the product of half a century's experience during which the metal working industry elected us by their patronage America's leading planer manufacturer.

Skill learned by our veteran craftsmen in building 7000 machine tools contributes fine workmanship to each new Hypro Planer.

Our engineers have added to the time tested Hypro-duction features many patented improvements that increase Cincinnati Planer accuracy, smooth flowing power and ease of control.

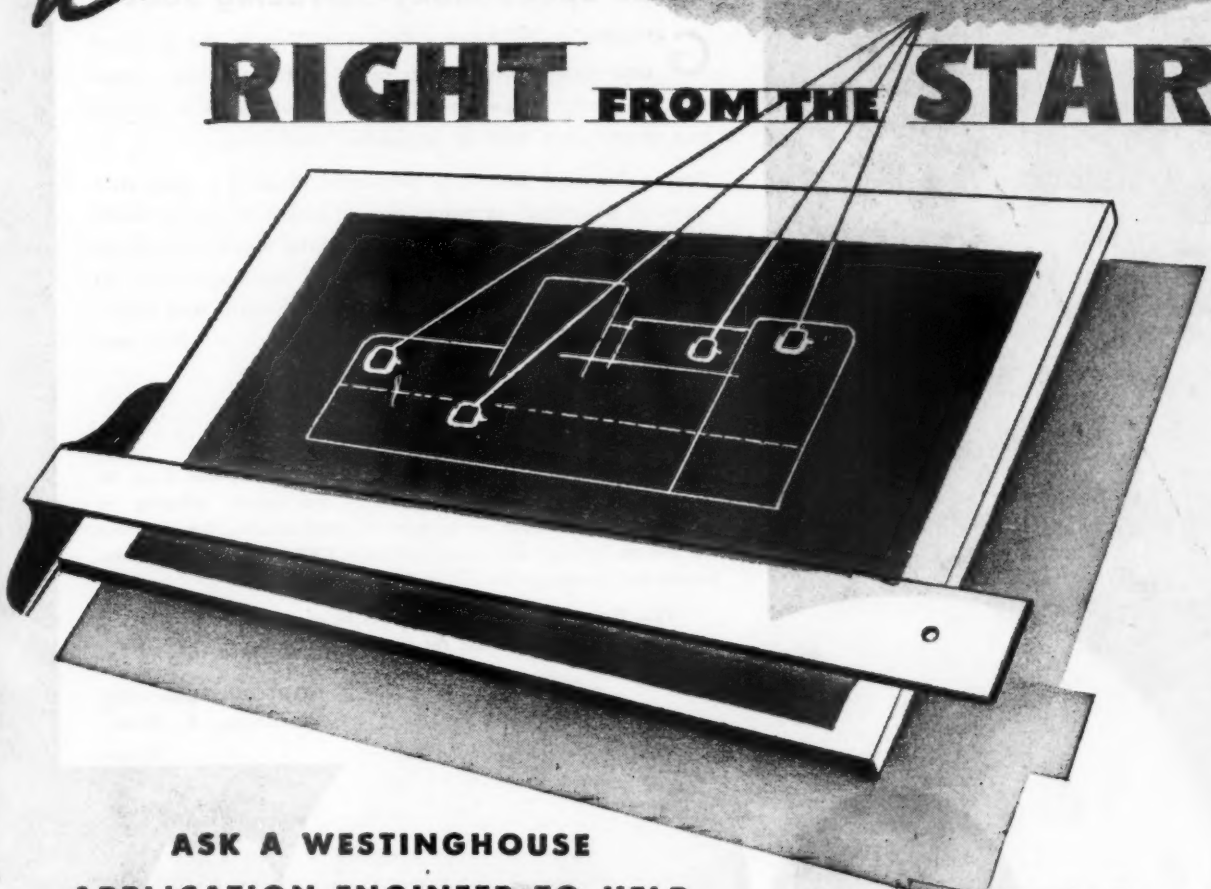
Write for Bulletin 154 describing Hypro Machine Tools

THE CINCINNATI PLANER COMPANY
Planers...Vertical Boring Mills...Planer Type Millers
CINCINNATI . OHIO . U.S.A.

Double Check

MAKE SURE THE MOTOR APPLICATION IS

RIGHT FROM THE START



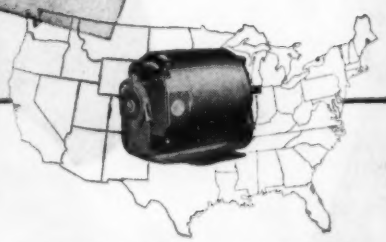
ASK A WESTINGHOUSE APPLICATION ENGINEER TO HELP

Check it three times, if necessary, to make certain your product design makes use of standard motor types whenever possible. Minor changes in the appliance may permit utilizing standardized designs instead of more costly specially-engineered units.

Such designs hold many advantages for both you and your customers. Costs are reduced and deliveries speeded. Required inventories are lowered. Servicing is simplified.

Let the broad experience of Westinghouse Engineers in applying fractional horsepower motors help you with your appliances while they are still on the drawing board. The time is now. Ask your Westinghouse office or write Westinghouse Electric & Manufacturing Company, P. O. Box 868, Pittsburgh 30, Pa.

J-03216



MOTOR EXCHANGE PLAN PROVIDES

REPLACEMENT SERVICE IN 24 HOURS OR LESS

ANYWHERE IN THE UNITED STATES

Westinghouse Motor Exchange points in all principal cities can service most Westinghouse small motors of standard sizes in 24 hours, or less, anywhere in the United States. This service gives the appliance user an efficient, factory-rebuilt replacement motor in exchange for his old motor at a low, flat cost. Your nearest Westinghouse office will give you full details. Ask for bulletin B-3336.

Westinghouse

SMALL MOTOR DIVISION

NORTON DISC WHEELS . . .

Can Speed Many Surfacing Jobs

GRINDING with Norton Resinoid Discs is the quickest and easiest way to do many surfacing jobs. These discs not only remove metal quickly but leave a surface that often needs little or no further machining.

Norton Resinoid Discs are available in all the sizes and types of mountings necessary for all makes of disc grinders —for both vertical spindle and horizontal spindle machines —in Alundum abrasive for steel and malleable iron—in Crystolon abrasive for gray iron, brass, bronze and aluminum. Norton Discs are also available in vitrified and silicate bonds.

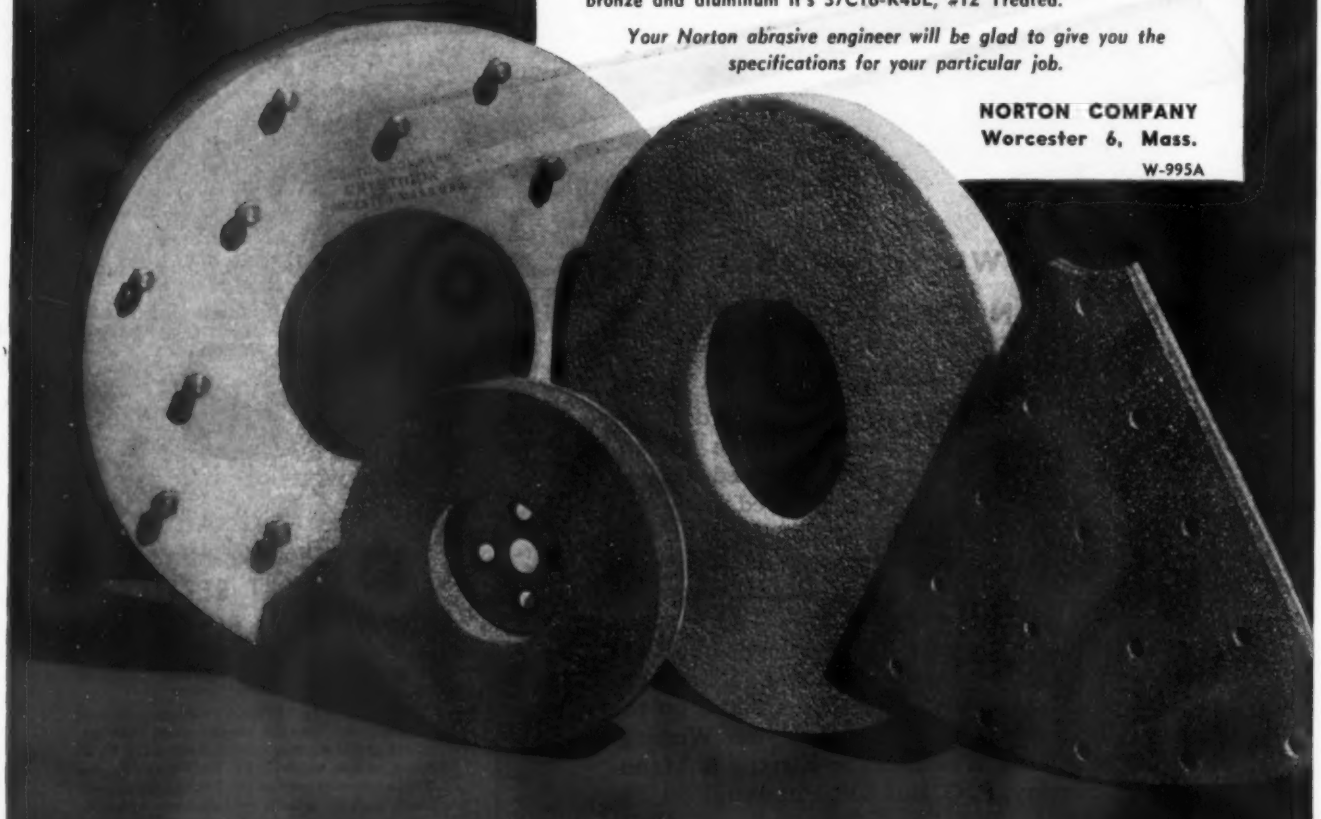
Suggested Specifications

A16-L4BL is a popular specification for Norton Resinoid Discs for steel castings. A16-L4BL "special" is particularly effective on malleable iron because of its abrasive combination. For cast iron the popular resinoid discs specification is 37C16-K4BL and for brass, bronze and aluminum it's 37C16-K4BL, #12 Treated.

Your Norton abrasive engineer will be glad to give you the specifications for your particular job.

NORTON COMPANY
Worcester 6, Mass.

W-995A



NORTON ABRASIVES

Get Extreme Accuracy, High Spindle Speeds and Ease of Operation with this HARDINGE Second Operation Machine

CAPACITY:
1/16" to 1" with collets
1" to 6" with step chucks
1" to 5" with jaw chucks
Spindle Speeds:
100 to 4000 r.p.m.

The combination of extreme accuracy, high spindle speeds and ease of operation means better results under the close tolerances of manufacturing standards both today and in the days to come. The ease and simplicity of operation enables relatively unskilled operators to produce parts to the necessary close limits without expensive tooling.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

BUT KEEP THAT GUARD UP!

PRODUCERS OF HAMILTON STEAM AND DIESEL ENGINES, CANNON AND MACHINE TOOLS

GENERAL MACHINERY CORPORATION

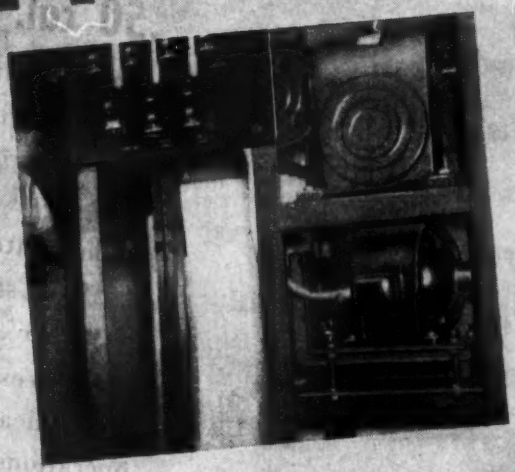
HAMILTON, OHIO

THE NILES TOOL WORKS CO. • THE HOOVEN, OWENS, RENTSCHLER CO. • GENERAL MACHINERY ORDNANCE CORPORATION

IN STUFFY SPOTS

Many a motor must be located where walls, adjacent equipment, or materials cut down the free flow of air. Sometimes, as in the case of this wool-dryer drive, surroundings are hot, and stuffy, too.

Tri-Clad motors have proved themselves cool-running even under such conditions. Their powerful, double-end ventilating system moves the air at controlled velocity for effective heat removal. The location and baffling of dual exhaust ports discourage recirculation.



Tri-Clad motor drives conveyor on wool dryer—Bigelow Sanford Carpet Co., Amsterdam, N. Y.

AIR-FLOW TESTS OF TRI CLAD MOTORS LEAD TO PROTECTION FROM OVERHEATING

Plenum chamber test of Tri-Clad motor ventilation at G-E motor factory.

Before new types or sizes of Tri-Clad motors are approved for production, plenum chamber tests are conducted on the ventilating systems of sample models. These measurements serve as a check on previous calculations of the volume and velocity of air through the motor under different conditions. Other tests under load within enclosures and at abnormal ambient temperatures are also made. If your motors must be confined in stuffy spots, G.E. can help you make the right choice to beat the heat. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

TRI CLAD MOTORS

Buy all the BONDS you can—*and keep all you buy*

"Put it on the Blanchard"

Get These Advantages

- Production ✓
- Adaptability
- Fixture Saving
- Operation Saving
- Material Saving
- Fine Finish
- Flatness
- Close Limits ✓

.50 cal. Bolts on No. 18 – 30" Chuck

These bolts are held in fixtures, locating from hole in bolt, for grinding two sides square. The opposite sides are then ground, holding the bolts directly on the magnetic chuck.

The material is alloy steel measuring 9⅝" x 2⅛" x 2⅛". .007" of stock is removed from each side to limits of ± .00075". 50 surfaces are ground per hour.

Surfaces that are accurately square and parallel are economically produced by Blanchard Grinding. Later operations can be done better and quicker because of having these surfaces for locating and holding.

This job being done on the No. 18 Blanchard Surface Grinder

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

NEW!

and definitely BETTER

STANDARD *Decimatic*

DIAL INDICATOR

★ *BETTER because:*

Newest addition to STANDARD line, purposely designed to give you these gaging advantages:

★ Perfect repeatability, whether workpiece is applied slowly or abruptly.

★ Hand registers instantaneously, without whip or waver. Red hand lessens fatigue; speeds inspection.

★ Decimal dial graduations, as on blue print, eliminate errors in reading.

★ Reduced spindle tension, in some models up to 50%, and reduced internal friction give greater sensitivity.

★ Range less than one revolution. Avoids errors on parts more than a revolution oversize. (Range may be increased by removing stop collar).

★ Patented "Shockproof" design protects mechanism and is key to the *superior* accuracy of this Indicator.

★ Upper half of face free of excess markings to facilitate easy reading.

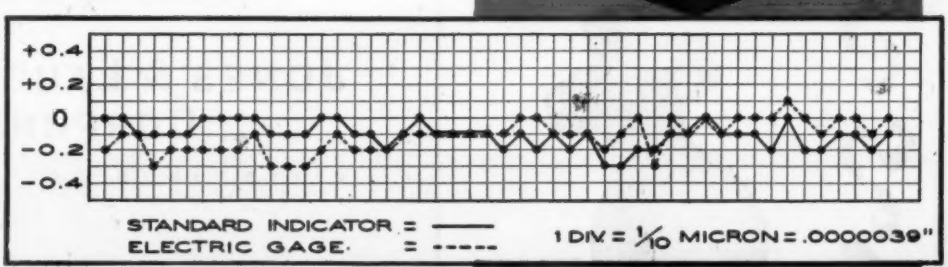
★ All mounting dimensions AGD standards.

Ask for Special Decimatic Bulletin

Catches Rejections Red-Handed

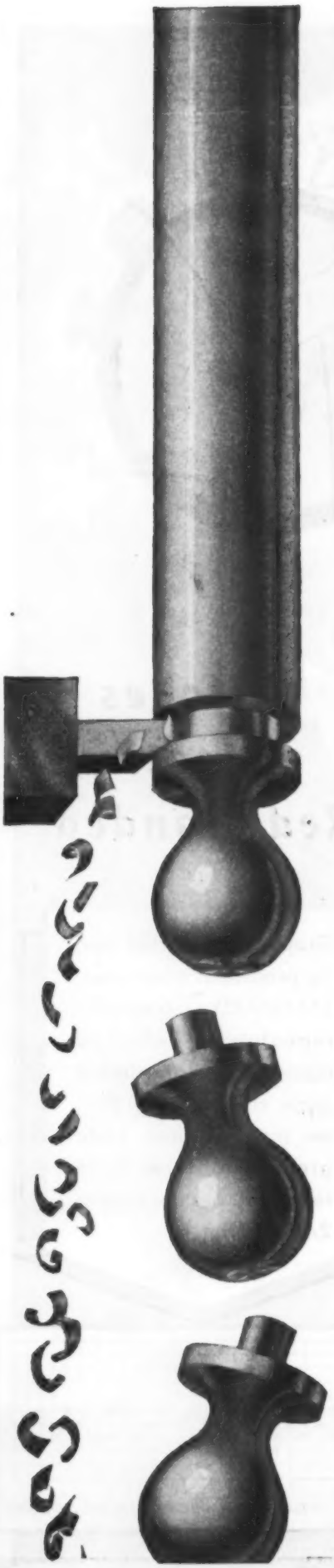
Graph of impartial test by prominent gage user. STANDARD *Decimatic* repeatability checked against elaborate electric gage costing more than ten times as much. Note greatest difference in readings does not exceed 2/10 micron.

A Convincing Comparison of Precision



STANDARD GAGE CO., INC., *Poughkeepsie, N.Y.*

J&L STEEL



COLD FINISHED

BESSEMER SCREW STOCK

Uniform Bessemer Flame Control free cutting steel for superior parts.

Our metallurgical engineers will be glad to discuss your production problems with you.

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH 30, PENNSYLVANIA

What's going to happen to the SUZY Q?

Remember the graveyard of rusting ships after the last war? For years a grim reminder of surplus war production, they also represented a practically bankrupt shipbuilding industry.

Today, America's aircraft industry accounts for a substantial proportion of our total national economy. That industry has produced more than a quarter of a million planes since Pearl Harbor! Its plants, equipment and production represent 50 billion dollars worth of taxpayers' money.

Here is the most valuable single peacetime legacy of war. . . . Here is power to maintain peace, insure our national security and provide jobs for millions of Americans . . . And here is a critical problem.

For the percentage of profit earned by our aircraft industry is so low that its entire capital reserves amount to only a few days' operating costs! The lack of a sound national airpower policy could actually result in the collapse of a great industry and the promise it holds for the whole world.

We at Bryant know that we can sell many machine tools to a healthy peacetime aircraft industry. But far more important — those tools mean jobs, and our last chance to enforce peace throughout the world.

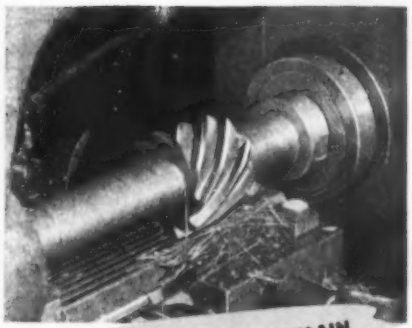
BRYANT GRINDER COMPANY SPRINGFIELD VERMONT, U.S.A.

FOR OUTSTANDING PRODUCTION, USE...

BARBER-COLMAN

HOBS • HOBBING MACHINES • HOB SHARPENING MACHINES • MILLING CUTTERS
REAMERS • REAMER SHARPENING MACHINES • SPECIAL TOOLS

MILLING CUTTERS



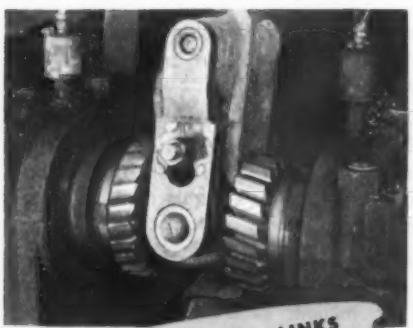
"PARAFORM HEAVY DUTY PLAIN MILL REMOVES 1/8" STOCK, 2-29/32"x3-3/4", IN SAE1040 STEEL, 375-429 BRINNEL IN 4-1/2 MINUTES FLOOR-TO-FLOOR. FEED 2.6" PER MINUTE —SPEED 55 SURFACE FEET."

These examples of Barber-Colman Milling Cutters in action illustrate outstanding production capacity. Note the variety shown, not only of materials, but also of types of cutters. If you are interested in further details on any of these jobs, we will be glad to furnish them on request.

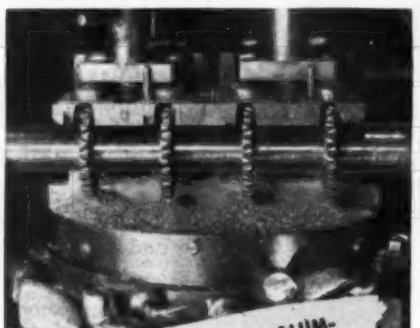
We now carry a large stock of Standard Cutters for immediate shipment so that, within a few hours after your order is received, the specified tools can be on the way to your plant. If you should require End Mills, Plain Mills, Side Mills, Saws, or other Profile Cutters that may differ slightly from standard listings, *specially engineered* B-C CUTTERS for your particular problem can be furnished on SHORT DELIVERY.

Be sure your 1945 Cutting Tool Files are up-to-date with a copy of our Complete Milling Cutter Catalog ML.

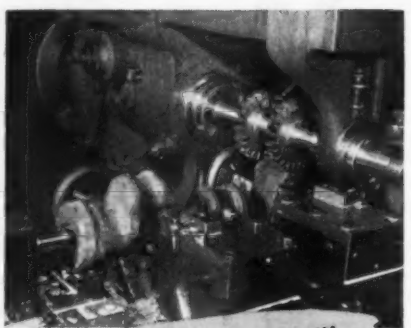
"2 PIECES EVERY 45 SECONDS, USING 12" FEED AND 104 SURFACE FEET PER MINUTE IN GRAY CAST IRON. STOCK REMOVED— 3/32" x 3-1/8" x 3-7/8"."



"260 FORGED TRACK LINKS MILLED PER HOUR, STEEL FORGINGS, 170-187 BRINNEL, REMOVING 5/32" STOCK—19" FEED—102 SURFACE FEET PER MINUTE."



"DEEP SLOT MILLING IN ALUMINUM, FOUR PIECES EVERY 12 SECONDS, PLUNGE CUT SLOTS 3/8" x 5/8" x 1" WITH 10.58" FEED PER MINUTE AND 270 SURFACE FEET."



"85 PIECES IN 8 HOURS IN FORGED 1045 SPECIAL STEEL, USING 8-C 5" SIDE MILLS AT 5-1/4" FEED AND 55 SURFACE FEET PER MINUTE, REMOVING 3/8" STOCK."

Accurate! *Dependable!*

Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST., ROCKFORD, ILLINOIS

TODAY ...DESIGNED FOR A SPECIFIC JOB

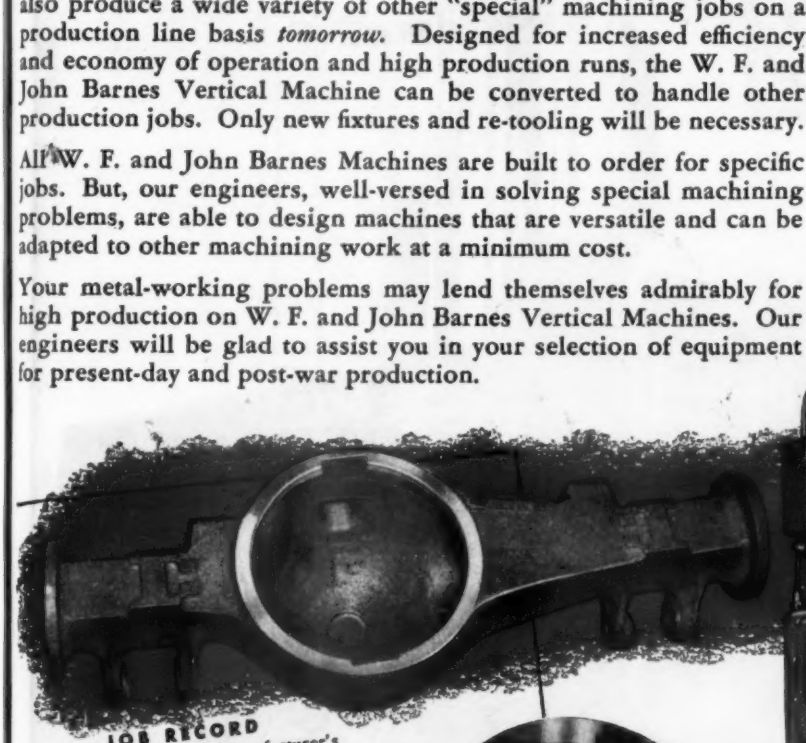
TOMORROW ...ADAPTABLE TO OTHER PRODUCTION

Conversion Costs Reduced To Minimum

Especially designed for a particular job *today,* the W. F. and John Barnes 924 Vertical Machine, because of its unusual adaptability, will also produce a wide variety of other "special" machining jobs on a production line basis *tomorrow.* Designed for increased efficiency and economy of operation and high production runs, the W. F. and John Barnes Vertical Machine can be converted to handle other production jobs. Only new fixtures and re-tooling will be necessary.

All W. F. and John Barnes Machines are built to order for specific jobs. But, our engineers, well-versed in solving special machining problems, are able to design machines that are versatile and can be adapted to other machining work at a minimum cost.

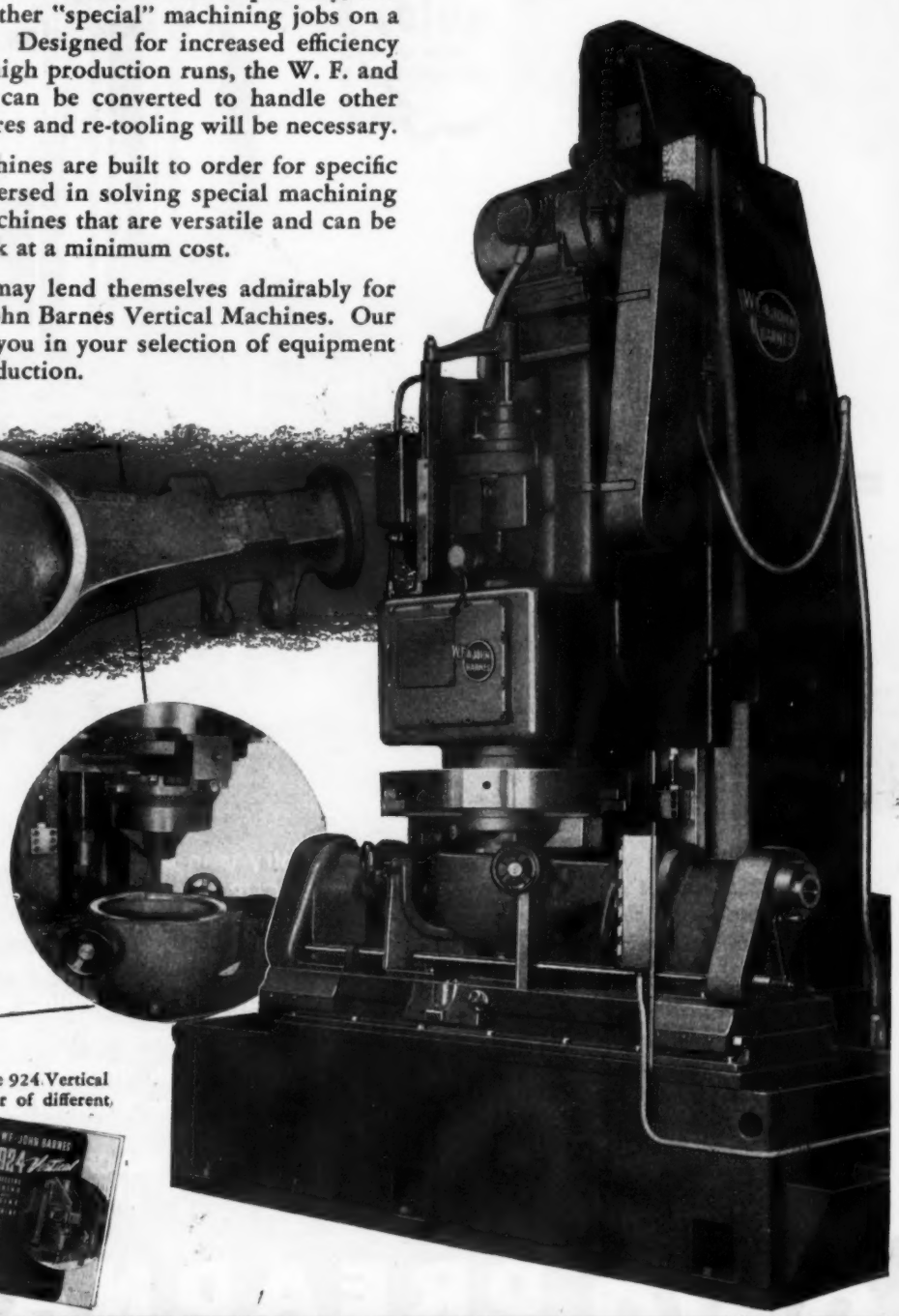
Your metal-working problems may lend themselves admirably for high production on W. F. and John Barnes Vertical Machines. Our engineers will be glad to assist you in your selection of equipment for present-day and post-war production.



JOB RECORD

In this well-known manufacturer's plant, the W. F. and John Barnes 924 Vertical Machine operates in a cycle of rapid approach, bore and chamfer to depth (positive stop), feed-out face and rapid return, with push-button remote control for starting the cycle.

The piece — an axle housing rough casting requires rough, semi-finish, finish boring and chamfering 15⅝" diameter; and rough, semi-finish and finish 17¾" diameter face. A special holding fixture supplied by the customer, facilitates this work. The entire time consumed for these various machining operations, performed on ONE W. F. and John Barnes Vertical Machine, is 7½ minutes.



Our four page bulletin illustrates how the 924 Vertical Machine has been applied to a number of different types of high production drilling, boring and facing operations. This is a bulletin you should have in your files — write for a copy today — Ask for Bulletin No. 345.

W.F.&JOHN BARNES

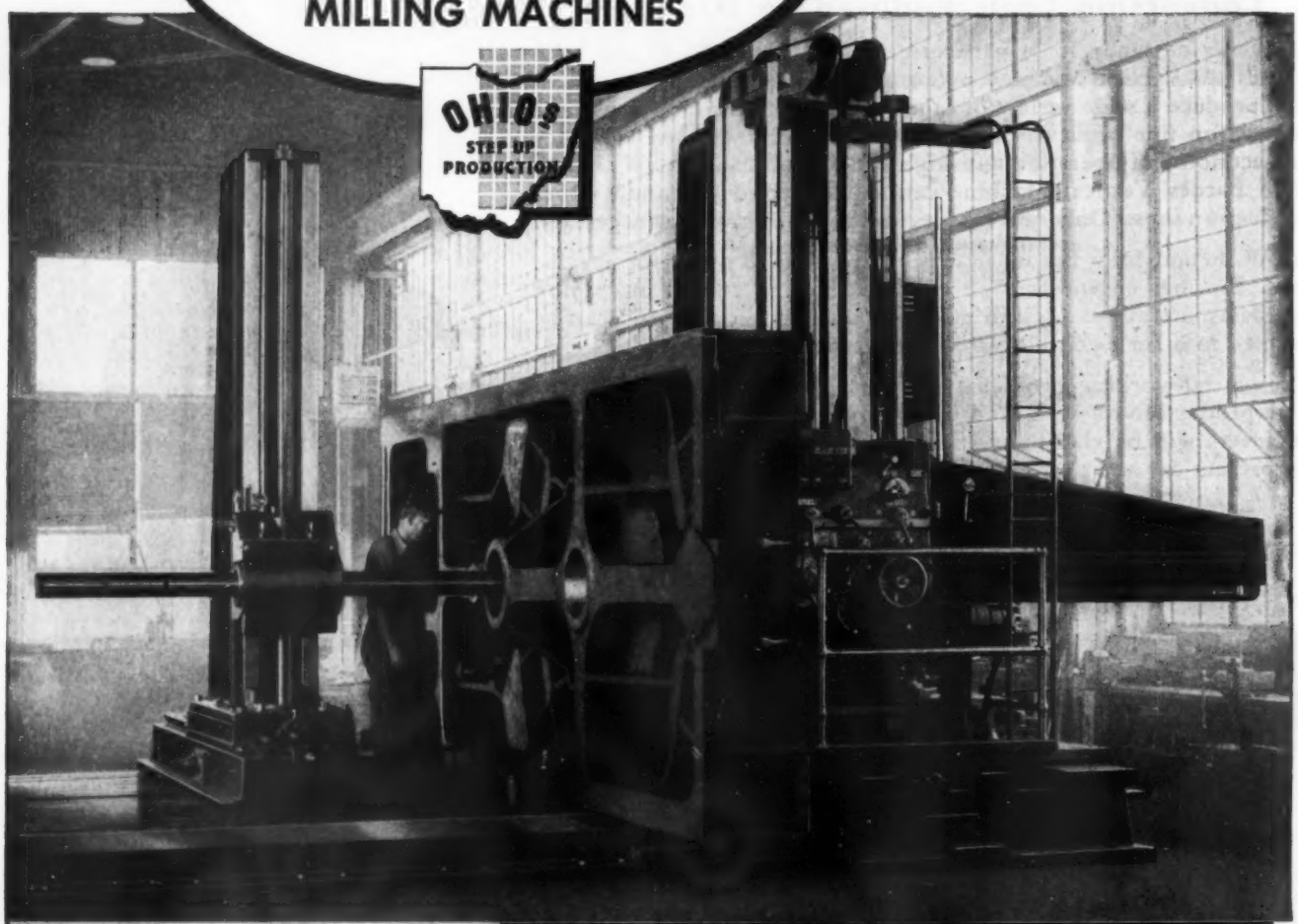
W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

ORDERS
for Ohio Horizontals are being shipped with reasonable promptness.

OHIO HORIZONTAL

BORING, DRILLING AND MILLING MACHINES

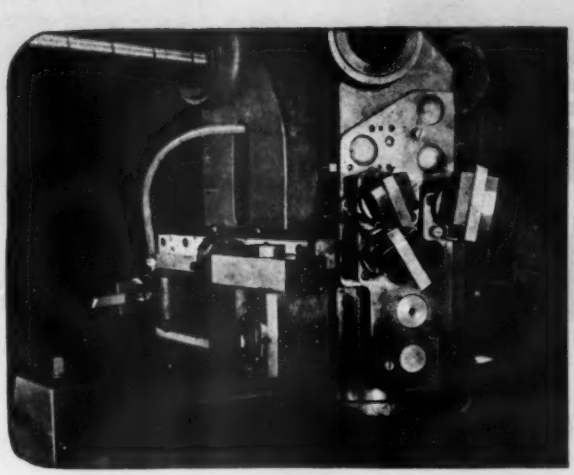


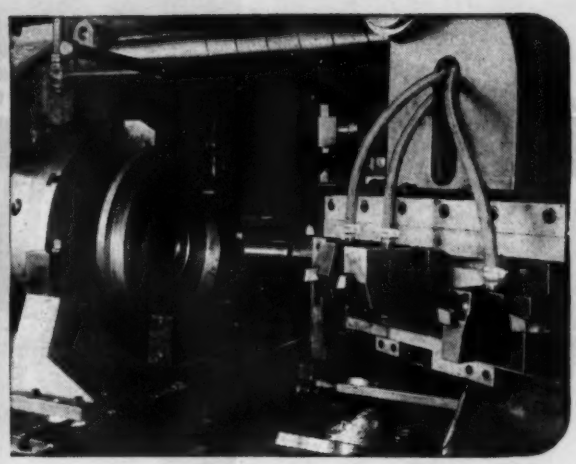
Boring, drilling, and milling operations on a 22000-pound cast steel power shovel base were handled accurately on a 6 FA Ohio Horizontal.

This country is in a big hurry. Production must mount — WITH ACCURACY. Quantity of work *with quality*, if you please. Ohio Horizontals are built for power and precision, together with safety and easy handling. Their many features today are in keeping with a record of performance which goes back to 1930, when America's first all-anti-friction boring, drilling, and milling machine appeared, bearing the name of Ohio. . . . *Get Bulletin 1000.*

THE OHIO MACHINE TOOL COMPANY
KENTON, OHIO

OHIO DREADNAUGHT
HORIZONTAL BORING, DRILLING AND MILLING MACHINES · SHAPERS · PLANERS





Your ORIGINAL INVESTMENT IN P&J EQUIPMENT INCLUDED RE-TOOLING POSSIBILITIES...

Take advantage of them – NOW!

Aside from the capacity of the machine, there are no practical limits to the variety of work that can be handled on P & J Chucking Equipment. Flexibility in tooling, with ample power to back up heavy cuts, is an advantage inherent in P & J equipment, which can readily be taken advantage of at any time.

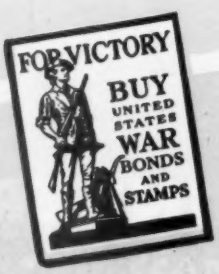
When the 8 DXT P & J Automatic Chucking Machine illustrated here was purchased, a special tooling set-up was designed and furnished for machining flywheels. However, without changing basic outstanding features and performance, this machine can be re-tooled to handle other work.

P & J owners purchased re-tooling possibilities when they invested in P & J Equipment. Now, with re-conversion in the offing, is an opportune time to re-tool and obtain extra dividends on the original investment. Ask P & J engineers for assistance.

POTTER & JOHNSTON MACHINE COMPANY

Pawtucket, R. I.

EVERY BOND YOU BUY IS AN INVESTMENT IN FREEDOM



P & J REBUILDING SERVICE . . .

Your present P & J equipment can probably be restored to its original accuracy and productivity by rebuilding in our shop. It will pay you to investigate. Re-tooling can be handled conveniently at the same time.

PRODUCTION WITH PRECISION ASSURES PROFITS

The Rivett 918 Hand Screw Machine can produce in volume and maintain finish and size to the most exacting specifications. These characteristics have brought ideas into mass production that were once confined to the toolroom. Consider the Rivett 918 for finishing rough blanks or for producing from bar stock.

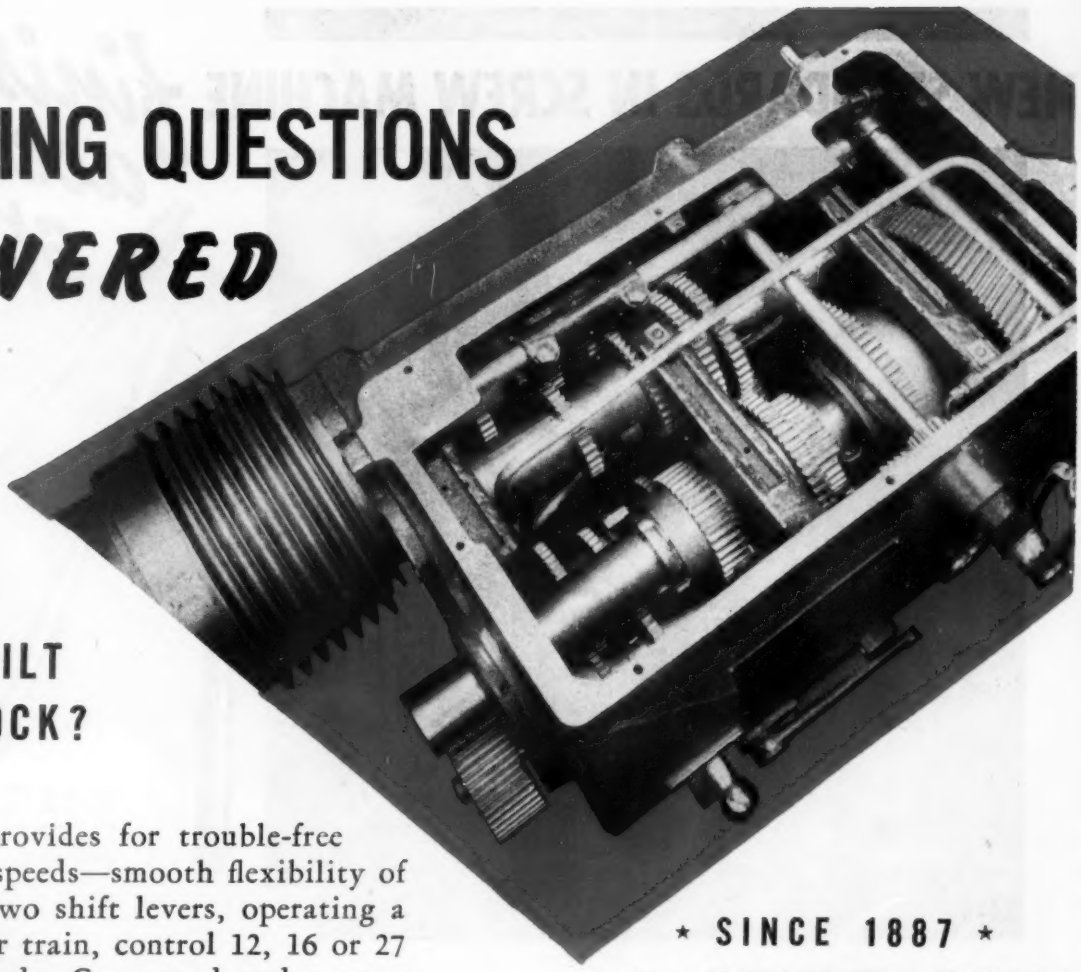
Write for Bulletin

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

TURNING QUESTIONS ANSWERED



WHY AN INNERBUILT HEADSTOCK?

Because it provides for trouble-free selection of speeds—smooth flexibility of operation. Two shift levers, operating a multiple gear train, control 12, 16 or 27 selective speeds. Compound and reverse feed gears are incorporated within the head. The compound lever, by multiplying the range of changes, further widens the range of feeds and threads. The chrome nickel alloy gears operate in filtered oil and slide on splined shafts mounted on anti-friction bearings. The Innerbuilt Headstock is just another one of many important reasons why LeBlond lathes are preferred by men who know precision-made machine tools.

★ SINCE 1887 ★

the world has been turning to LeBlond for turning equipment.

LEBLOND FIELD ENGINEERS are prepared to help you in your development work, particularly along the lines of the difficult, the out-of-the ordinary turning problems. The accumulated knowledge of every manufacturing trend in good times and bad —peace and war—gained over a period of nearly 60 years from thousands of installations all over the world, is yours for the asking. Contact our nearest dealer or write Dept. FE 46.

WRITE FOR CATALOG!

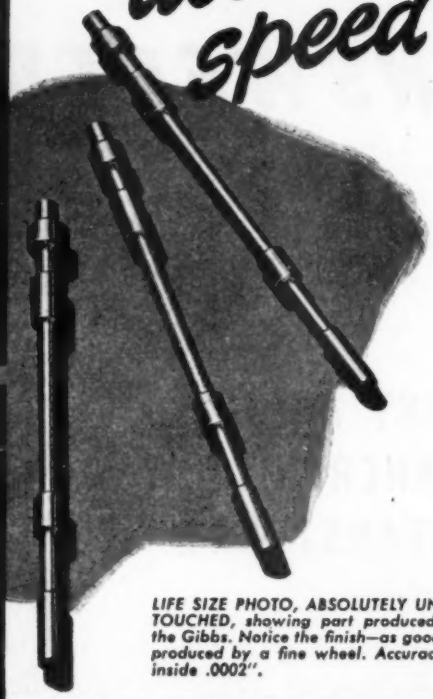
THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 13, 103 Lafayette St., CAnal 6-5281
CHICAGO 6, 20 N. Wacker Dr., STA 5561

ARMY E NAVY ★ YOUR BONDS BUY BOMBS ★ BUY A "BLOCK-BUSTER" TODAY! 10 1

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

NEW STANDARDS IN SCREW MACHINE *finish-accuracy-speed*



LIFE SIZE PHOTO, ABSOLUTELY UNRETOUCHED, showing part produced on the Gibbs. Notice the finish—as good as produced by a fine wheel. Accuracy is inside .0002".

THE GIBBS AUTOMATIC

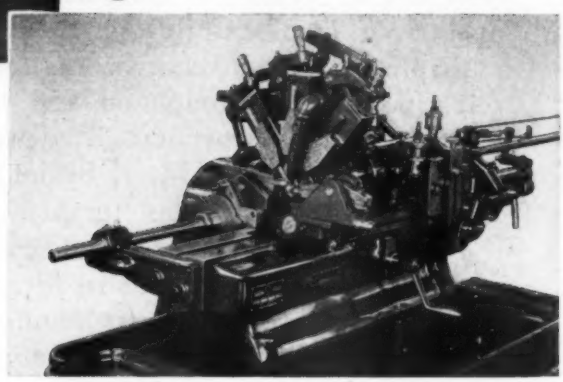
Do you want a finish on screw machine production comparable to fine finish grinding?

Do you want accuracy in diameter and concentricity, within .0002"?

Do you want production speed immensely aided by a machine so adaptable that second operations are unnecessary?

You get all these—and more in the Gibbs High Speed Automatic — the machine that turns small parts from bar stock, with five cam-activated tool bits that operate close to the bushing through which the stock is fed. No box tools, no form tools, no indexing turret.

The operations can include not only turning, but forming, drilling, threading, reaming, knurling, counterboring, undercutting, tapping, slotting, spotting.



EXCEPTIONAL FACTORS IN THE GIBBS AUTOMATIC

Micrometer adjustments on each of the five tool holders, allowing precision work within .0002"—

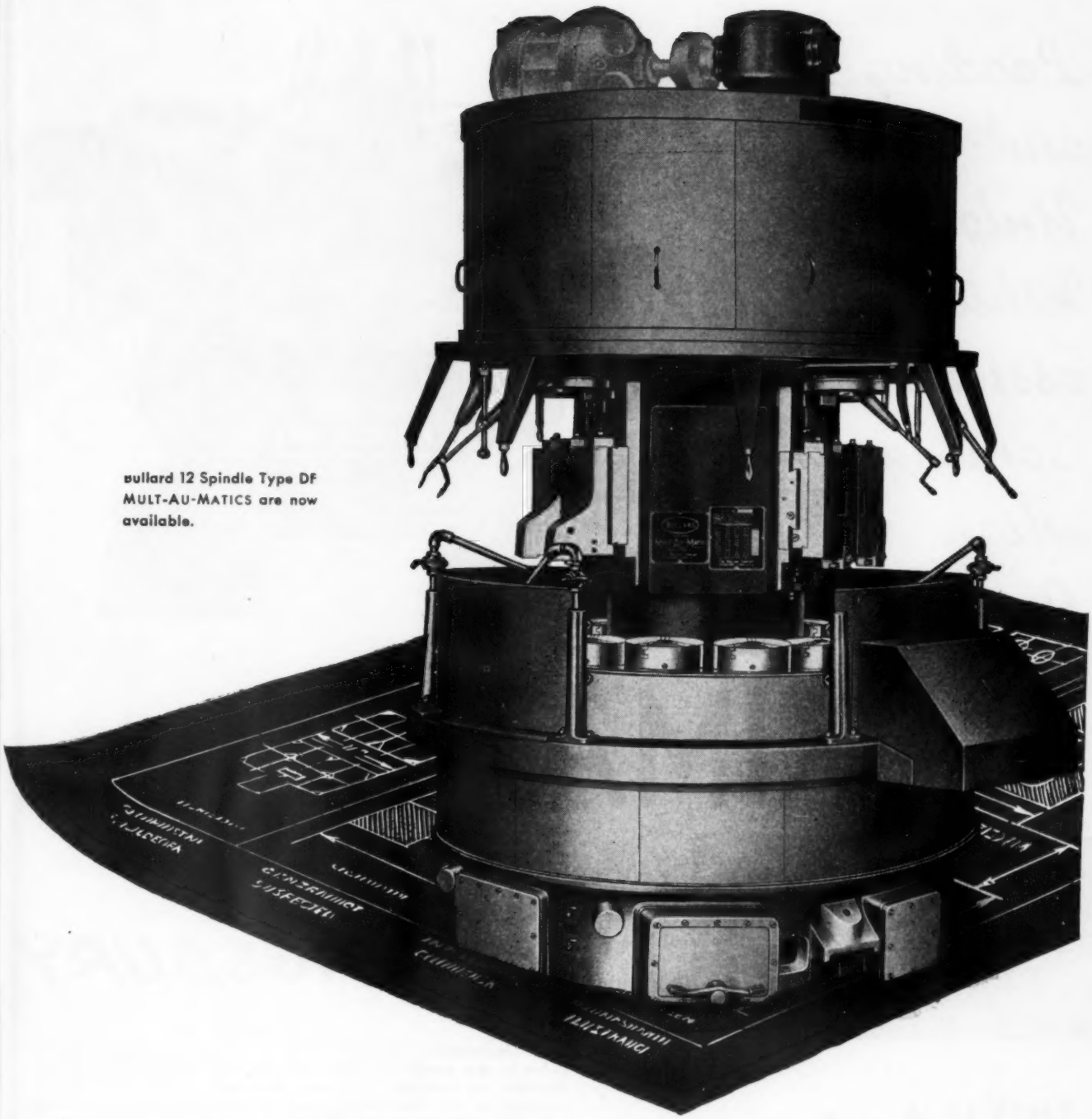
Range of spindle speeds of 1,000 to 10,000 rpm, by stepless control, allowing full advantage in use of tungsten carbide tools—

Additional attachments available

- **Single spindle drilling attachment**
- **Single spindle threading attachment**
- **Two-spindle drilling and tapping attachment**
- **Three-spindle drilling attachment (for spotting, drilling, reaming)**
- **Slotting attachment**

***SEE THIS MACHINE** in operation at the Scherr Demonstration Center (address below). Or write us for full information. If you wish, our screw machine consultant will be glad to visit you and check on the possibilities in your work.*

GEO. SCHERR CO., Inc. 201 LAFAYETTE STREET NEW YORK 12, N. Y.



Bullard 12 Spindle Type DF MULT-AU-MATICS are now available.

BULLARD MULT-AU-MATIC . . . TYPE DF

Twin Tooling Doubles Production With Investment Up Only Slightly

On work up to 8″ in diameter and 10½″ in height, you can now produce two finished pieces in the time of the longest single boring, turning, facing, threading, grooving or drilling operation plus a few seconds for indexing.

Twin spindles at each of the six or eight stations and twin tooling on the head of each working station mean that you double the ordinary MULT-AU-MATIC production output for its size of work.

That's lowering unit production costs in earnest . . . a *must* if free enterprise is to increase buying power and preserve full employment.

For full details about Bullard Twin 6 and Twin 8 Type DF MULT-AU-MATICS, write today for Bulletin DF1.

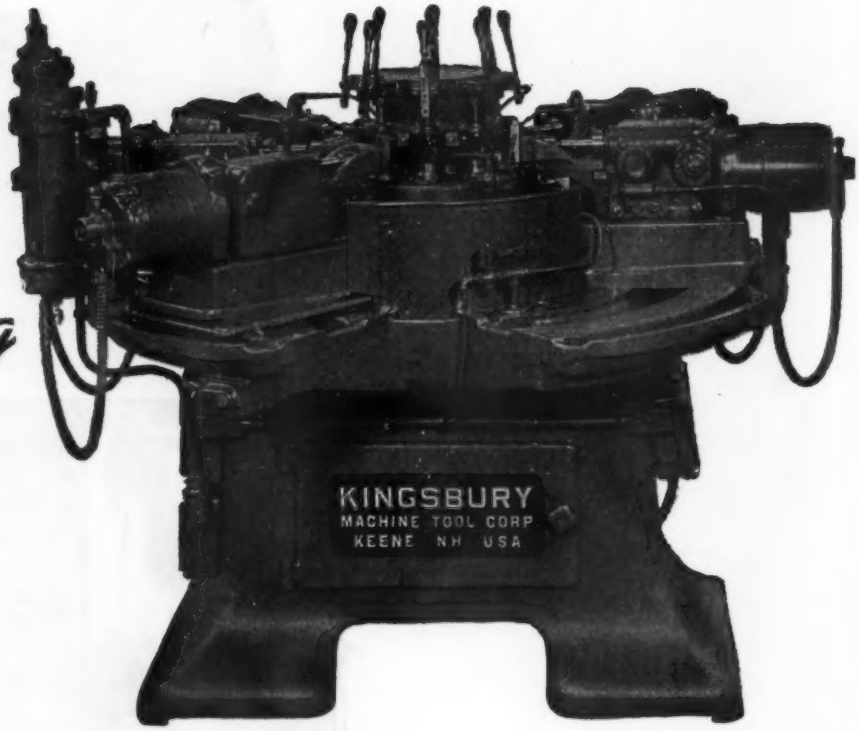
The Bullard Company, Bridgeport 2, Connecticut.

BULLARD

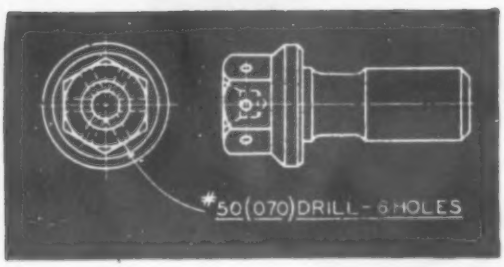
CREATES *NEW METHODS*

TO MAKE MACHINES DO MORE

Loading and Unloading While Drilling assures Continuous High Production



FLEXIMATIC



by KINGSBURY

This six-spindle FLEXIMATIC is set up for drilling lacing holes in the heads of screws for airplane motors. High production, so essential to parts involved in the speeded up program of this important phase of National Defense, is being achieved with minimum effort on the part of the operator.

The main turret of this FLEXIMATIC contains eight individual turrets which index 60° at each index of the main turret. Each of the six automatic drilling units on the machine drill a hole from the outside face of the hex head into the center only. The operator merely loads and unloads at the loading station while the holes are being drilled at the other stations on the machine. All six drilling operations are performed in a single chucking of the work.

Speed, convenient handling, accuracy and continuous production are universally recognized advantages offered by FLEXIMATICS regardless of the nature of the job assigned them to handle. The specific work being performed here is typical of many others where FLEXIMATICS are the machines for jobs calling for the maximum in time savings.

THIS IS A FLEXIMATIC AIRPLANE JOB!

Kingsbury Standard Units for drilling, reaming, boring, spotfacing and milling can be mounted in any combination, operated automatically and changed over quickly and easily to suit the requirements of the work to be handled.

KINGSBURY MACHINE TOOL CORPORATION
KEENE NEW HAMPSHIRE U S A

Ground Multiple

THREAD MILLING CUTTERS

by Continental

A Shell-type cutter with margin on each end

B Modified Acme thread form cutter

C Thread cutter button for Hall Planetary machine

D Shank-type cutter

E Shank-type two-diameter cutter

F Small diameter shank-type cutter with adapter

G Shank-type cutter

for fast, accurate production

Over 20 years' experience in precision thread grinding is built into CTW ground thread milling cutters . . . CTW ground thread milling cutters maintain dimensional accuracy on long production runs throughout the entire life of the cutter . . . Available in both shank and shell type, in National, Whitworth, Acme, V and special forms of thread. Many popular sizes carried in stock . . . For high production thread milling at lower tool cost, use Continental (CTW) ground thread milling cutters. Write to Continental today.

CONTINENTAL TOOL WORKS

Division of Ex-Cell-O Corporation

DETROIT 6, MICHIGAN

CONTINENTAL TOOL WORKS
CTW
EX-CELL-O CORPORATION

Continental
CUTTING TOOLS

- Boring Bars and Tools
- Broaches
  Broach Pullers
  Broaching Fixtures
- Core Drills
- Counterbores and Countersinks
- CTW Drive Holders
- Counterbores (Tool Room Sets)
- Counterbore Pilots
- Inserted Blade Cutters
- Carbide Tipped Cutters
- Form Relieved Cutters
- Milling Cutters
- Thread Milling Cutters
- End Mills
- Side Mills
- High Speed Steel Reamers
- Carbide Tipped Reamers
- Shell Reamers
- Inverted Spotfacers
- High Speed Steel Tool Bits
- Carbide Tipped Tool Bits
- Circular Form Tools
- Cut-off Tools
- Flat Form Tools
- Dovetail Form Tools

45-40

Close Limits and Fine Finish -

FOR EFFICIENT PRODUCTION

Close limits and a fine finish are essential for efficient production on many important metal working operations. Maximum output at minimum cost can be attained only when the methods and machines are such that close tolerances and the best possible finish can be maintained on piece after piece, indefinitely.

It is on this type of work—exacting toolroom jobs or production operations that call for toolroom accuracy—that the high precision and dependable performance of South Bend Lathes pay real dividends. Their smooth operation through a wide range of spindle speeds produces surprisingly fine finishes. In fact, when South Bend Lathes are installed, subsequent finishing operations can often be eliminated.

Today South Bend Lathes are better in every way. Our entire plant is devoted to lathe production—we manufacture no other products. There has been no lowering of standards because of war-time restrictions or shortages and the use of substitute materials is negligible, limited to non-essential parts such as name plates, paint, etc. Improvements have been accelerated to meet war production needs.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes are available in two sizes: Series 900 having 9″ swing with ½″ collet capacity, and Series 1000 having 10″ swing with 1″ collet capacity.

Lathe Builders For 38 Years

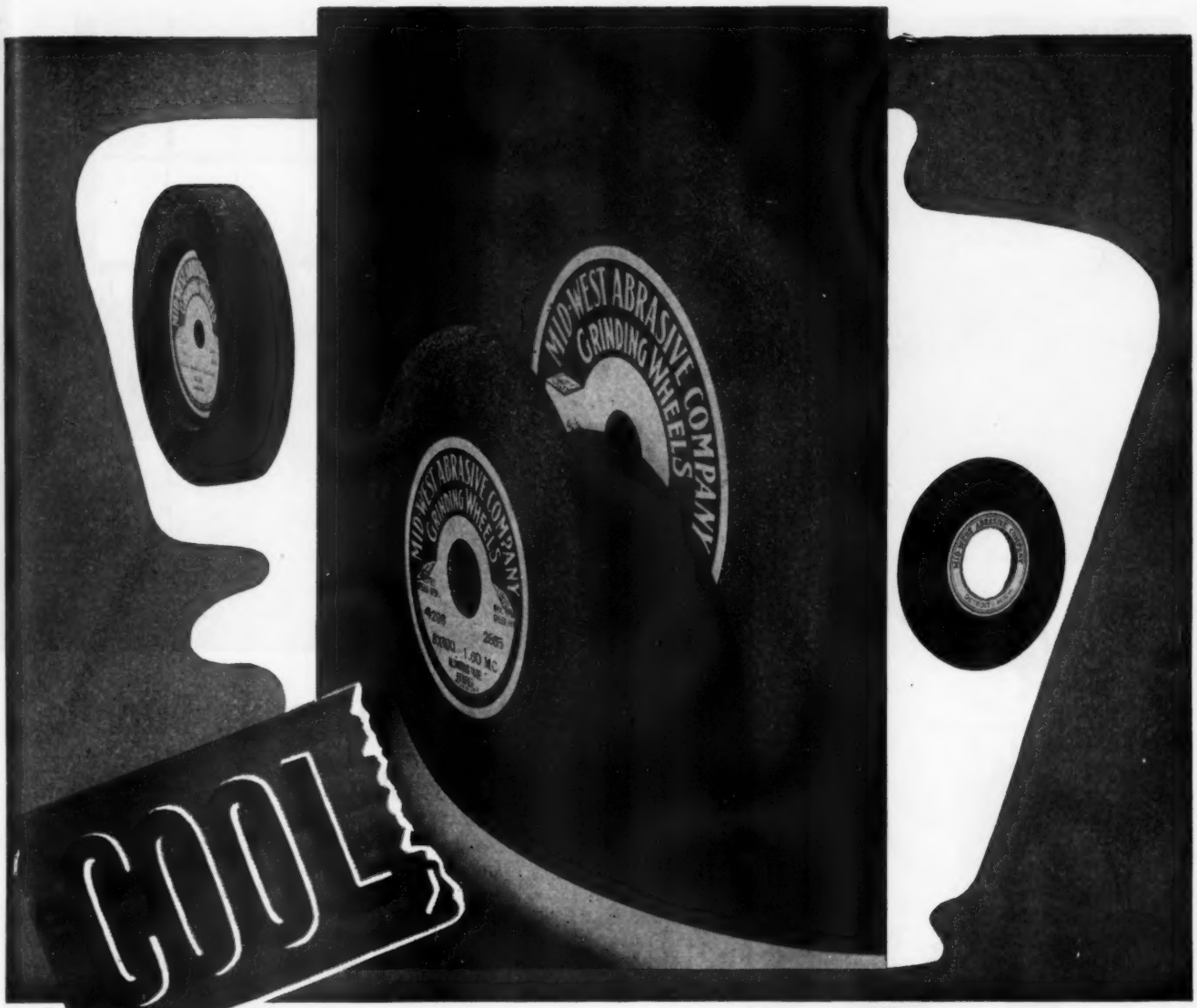
SOUTH BEND LATHE WORKS

419 EAST MADISON STREET • SOUTH BEND 22, INDIANA

NEW CATALOG NOW READY

Write For It!

Illustrated in full color—showing all types and sizes of South Bend Lathes. Contains complete information on specifications, capacities, construction features, and attachments. Ask for Catalog No. 100-D.



Swift and Sure!

A grinding wheel that cuts cool at high rates of speed, producing amazingly fine tolerances, is only one of the many outstanding products of the Mid-West Abrasive Company.

Engineered quality is built into each of the many items in the broad Mid-West line of classifications—honing and sharpening stones, sandpapers, rubbing bricks, abrasive specialties or wheel dressers.

Let one of the Mid-West staff of experienced field engineers survey your abrasive needs and recommend the items to meet them.

MID-WEST ABRASIVE CO.

Manufacturers of DEPENDABLE Abrasives

Owosso, Mich. • 1960 E. Milwaukee, Detroit 11, Mich. • Rochester, Pa.

MAIL COUPON FOR FREE POCKET HONE

Mid-West Abrasive Co.
1960 E. Milwaukee Ave., Detroit 11, Michigan

Please send me your complete data book on grinding wheels.

NAME_____

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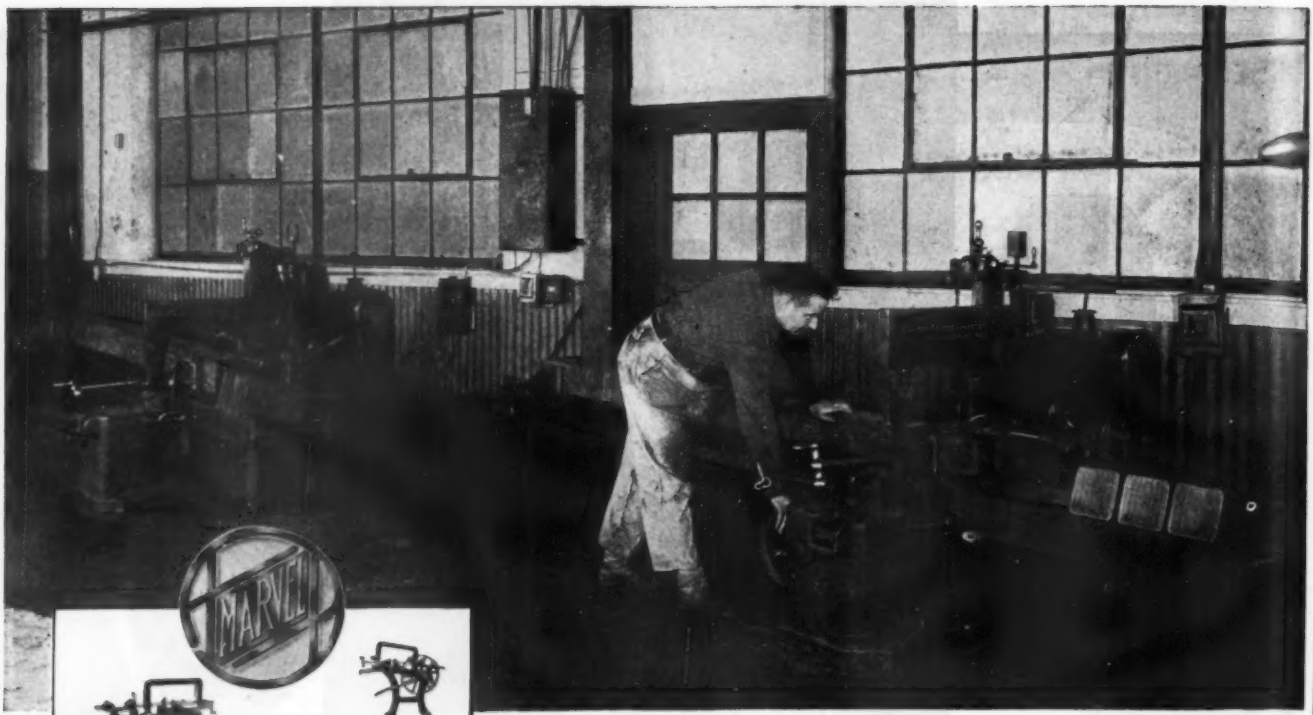
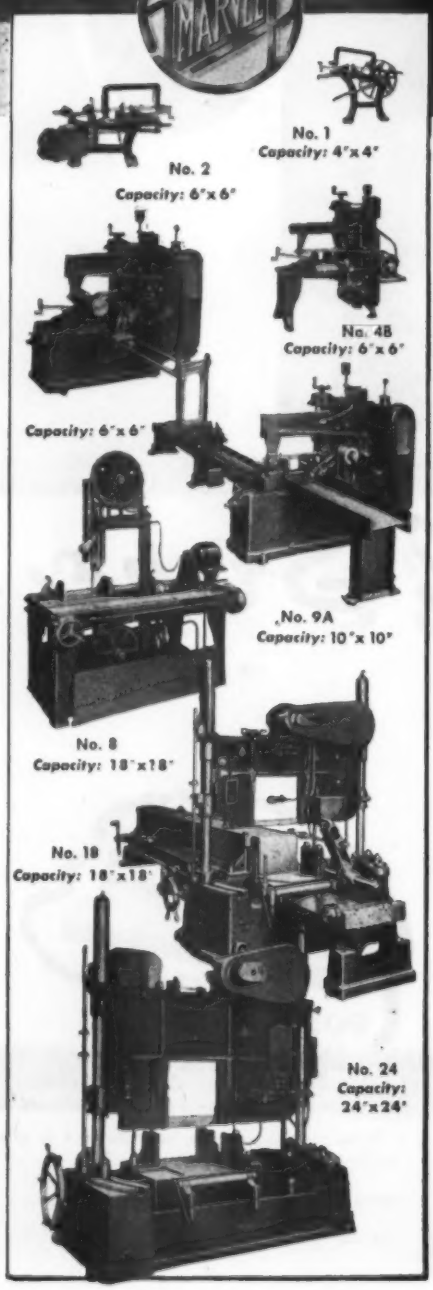




Keep 8 Drop Hammers Supplied with Forging Steel

At the Chicago plant of the Atlas Forgings Company, two MARVEL No. 9 High Speed Hack Saws, equipped with heavy duty work handling equipment, keep 8 drop hammers supplied with forging steel. The Atlas Forging Company (like most of the other leading forge plants of the country that have accepted MARVEL Saws as standard), have found that the hack saw method of cutting steel TO EXACT WEIGHTS is far more efficient and economical than with any other method formerly used by the industry.

With these two MARVEL High Speed Saws one operator can keep all 8 drop hammers supplied with EXACT SIZE billets and still have time for other work. The initial investment is small—and the cost per cut is unbelievably low. Contrast this with the old method of cutting-off, requiring a "crew" of hammer men for each drop hammer in the shop, and where the loss of steel was tremendous.

The MARVEL Saws shown above have found special favor with the forging industry and Machine Shops where heavy demands are put on hack sawing machines. This MARVEL Saw, with its rugged work handling equipment, will stand up under the heaviest punishment and for continuous 24 hour operation.

Write for Bulletins

ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. Bloomingdale Ave. Chicago 39, U. S. A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

MARINE DIESELS

are produced for new Victory Ships under noteworthy efficiency at the Nordberg Manufacturing Company plant, through whose courtesy this photo was obtained. The setup illustrated —showing a Super Service Radial in action—calls for a number of operations on Diesel engine beds. Six cored holes around each crankshaft bearing are drilled, reamed and backfaced . . . similar operations are performed on four cored holes between finished ends. Some of the holes are as large as 4" dia. by 23" in length; all are within close tolerances—attesting to the capacity, accuracy and convenience of the Super Service Radial in heavy duty war production.

Cincinnati-Bickford

SUPER SERVICE RADIAL

ARMY E NAVY

THE CINCINNATI BICKFORD TOOL COMPANY, OAKLEY, CINCINNATI 9, OHIO

PAYS ITS WAY

ON TAP LIFE ALONE!

Greater production, less scrap, are EXTRA dividends with a Warner and Swasey Precision Threading and Tapping Machine!

ONE tap now lasts as long as 33 once did at the Duncan Electric Manufacturing Company, Lafayette, Indiana. Formerly, Duncan turned out 125 pieces per tap grind. Today, on Warner & Swasey Precision Threading and Tapping Machines, a tap is good for 4200 pieces . . . an increase of 3260%!

In a big Mid-West tractor company, tap life on a 1" 14 pitch thread was 12 holes. The steel was of 325 Brinell hardness, a class 4 fit was demanded. After installing Warner & Swasey Precision Threading and Tapping Machines, tap life increased to an average of 166 holes . . . an increase of 1280%!

In addition to the cost of the taps, the Warner & Swasey Precision Threading and Tapping Machines saved the time that would have been lost in changing and grinding the taps under the old set-up.

One reason for this longer tap life is an automatic safety clutch that releases and stops the tapping operation if the tap becomes dull, hits a hard spot, or strikes chips in a blind hole. Another is the super-accurate patented combination of lead screw and solenoid actuated guide fingers. This feature eliminates bad errors and back lash . . . takes all extra drive pressure off the tap, allowing it to do only the work for which it is intended . . . cutting of threads.

If you're having trouble with excessive tap breakage . . . high rejects with class 3, 4, and 5 threads, let a Warner & Swasey field engineer show you, with figures, how installation of a Precision Threading and Tapping Machine will pay you handsomely!

WARNER & SWASEY · CLEVELAND · OHIO

YOU CAN MACHINE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

About New Machine Tool Orders

MORE THAN ONE machine tool builder has remarked that in all probability many machine tools ordered recently by the armed services will never be unboxed and put to work at the war jobs for which they are intended.

Two factors are responsible for this conclusion. One is that all through the war the feeling has been that over-ordering of machine tools has been frequently indulged in by the services "just to be on the safe side." In support of this observation, one may point to new machine tools that have been little used or not used at all.

The other factor is the inescapable logic that if orders were placed with care during the war years we have turned out enough machine tools thus far —roughly one million in five years—to produce all the planes and tanks and guns required to fight even a global war.

This sounds like an argument to stop making machine tools. It isn't that. It is instead a plea to our war officials to see whether they can find the machines they need to do specified jobs without resorting to orders for new machine tools.

The easiest course is for an official, confronted by a new war contract, to ask for a new machine. A harder but more sensible procedure is to search first for available existing equipment.

War service agencies are reported to have ordered recently new machine tools, though the same agencies had issued surplus equipment lists containing machines that could do the desired work.

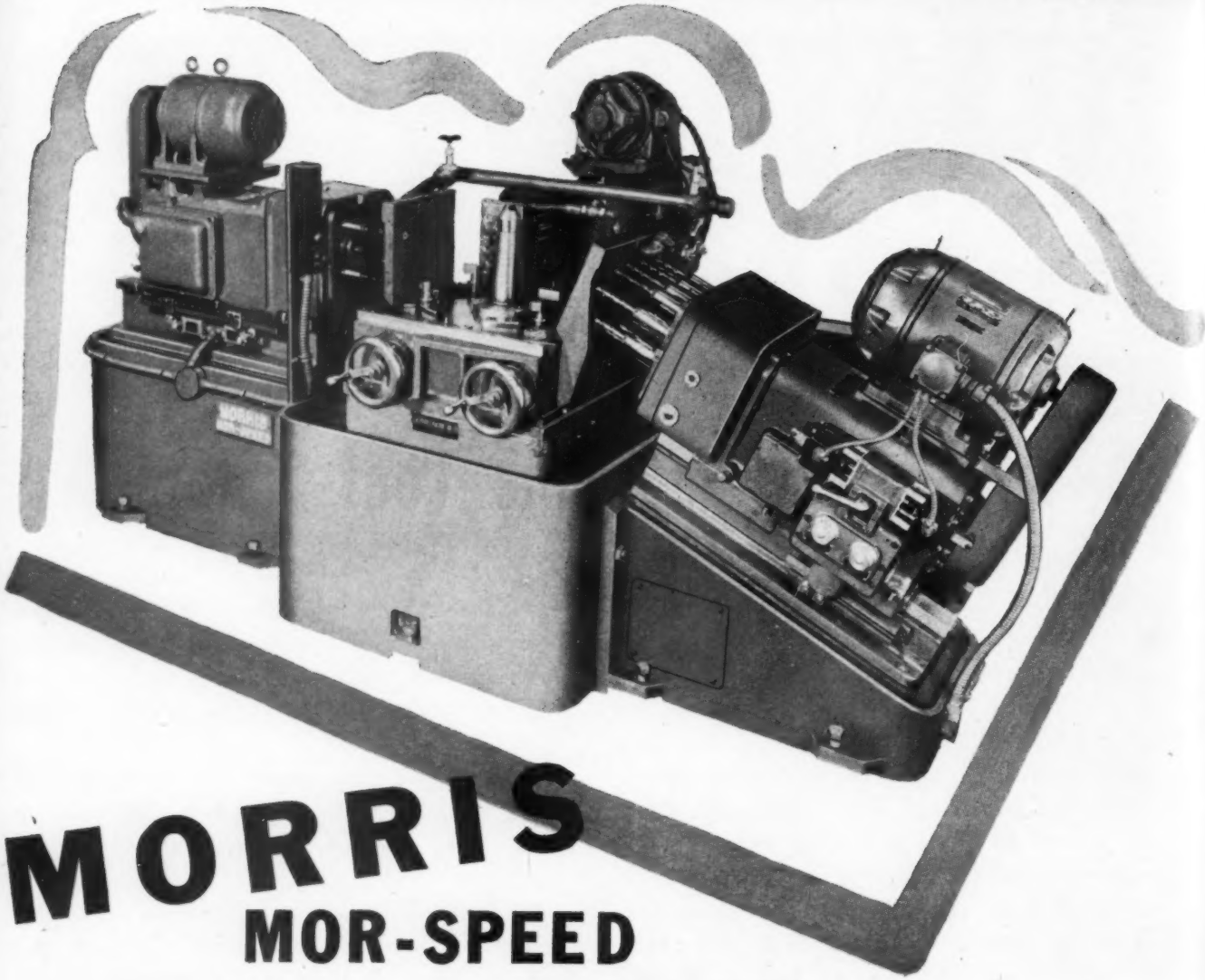
That doesn't make sense! It is a lazy way of doing things, is costly to taxpayers, and piles up still higher the postwar problem of surplus machines.

The records show that we can muster in this country for the war effort some two million old and new machines. It is believed that at least forty thousand of them are idle today.

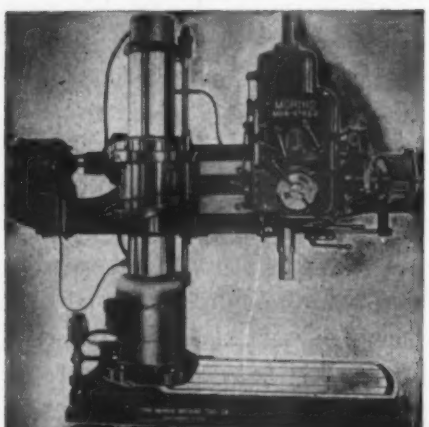
Before we rush to machine tool builders with requests for still more machines, let's be dead sure that we *must* have them. *If* we are satisfied that the new machines will be indispensable and there is no substitute for them, well and good. We must proceed to build them as rapidly as is humanly possible, for each day that we can save is likely to spare the lives of our fighting men.

The process of looking about first for suitable available equipment before blindly requesting new machines to be built, will save time, will conserve manpower, and will keep our postwar surplus headache from getting bigger than it already promises to be.

Burnham Finney



MORRIS
MOR-SPEED
High Production EQUIPMENT...



● The machine shown is typical of the specialized equipment designed—developed—and built by Morris to meet a specific high production requirement.

This machine was designed for drilling and reaming aircraft engine parts. It has 22 spindles operating from three sides of the work at one setting. Each of the heads is a standard hydraulic unit. The work is held in operating position by means of a hand clamp.

If you are in need of special equipment for high production of precision work consult Morris. They have the engineering experience—the organization—and the facilities for developing special machines for specific jobs. *No obligation.*

Builders of MOR-SPEED Radials

The MORRIS *Machine Tool Co.*

CINCINNATI 3, OHIO

Glass-reinforced plastic is shaped with a tungsten - carbide tipped toolbit

MACHINING

Glass-Reinforced Plastic
WITH CEMENTED CARBIDE TOOLS

BY HARRY CRUMP, CARBOLOY COMPANY, INC.

GLASS - REINFORCED PLASTICS are a mechanical combination of glass fiber reinforcing members encased in, and bound together by, a plastic material. The excellent properties of this material have naturally resulted in its use as a substitute for, or improvement upon, more familiar material. This use has demonstrated the necessity of special techniques in tooling and machining operations for this material.

The highly abrasive nature of the fine glass dust resulting from machining operations and the high tensile strength of the fibers result in a short life for ordinary cutting tools. Cemented carbide is the tool material most resistant to the destructive effects of the hard and abrasive materials formed while machining. Even this material requires special forms, cutting angles and operating procedures to prevent excessive physical contact of cutting edges. Light cuts and moderate speeds are necessary to protect both the work and the tool.

Although the dust resulting from machining operations does not appear to constitute a definite fire hazard, adequate provision for removal of dust and chips is advisable as the dust is irritating to the skin and mucous membranes and may be dangerous to the operator. The best method of removal is by air suction to a filtered discharge.

A stream of compressed air will greatly aid in cooling the tool. When a liquid coolant is necessary, water usually will be found to be as good as any other. Oil and fatty base coolants, as well as those coolants containing a solvent, are apt to damage the material permanently either

by softening it or by penetrating the plastics. All liquid coolants have the further disadvantage of combining with fine dust to form a hard cake which interferes with machining.

Turning Operations

Ordinary metal-cutting lathes can be used for all turning operations. Cutting speeds of between 150 and 200 surface ft. per min., together with a feed of about 0.010 in. per rev., have been found to be satisfactory. Female centers give much better results than male centers for turning laminated stock, as the male center exhibits a tendency to wedge the laminations apart. When facing or counterboring, the cut should always be made toward the center to keep the material under compression while cutting.

It is important in both facing and turning operations that tools be so set that the heel of the cutting edge will cut in advance of the point. In this way, the stock is sheared in the same direction in which it is being removed. If the tool is set so that the point is in advance of the heel of the cutting edge, it will tend to peel off the stock and throw up a fin or burr.

A straight tungsten-carbide has been found to be the best material for lathe tools for machining the glass-reinforced plastics. Carboloy, Grade No. 883, combines high wear resistance with a good degree of toughness, and gives excellent results. Where even greater wear resistance is desired, and a slight decrease in toughness is permissible, Carboloy 905 or its equivalent works well. Tools for turning these glass-reinforced plastics should be so ground as to have approximately 33 deg. clearance angle; no back slope or lips; and a top side rake of around 13 deg. The large clearances keep the tool from rubbing on either the work or the chips, a condition which would tend to accelerate wear of the cutting edge due to the highly abrasive nature of the glass fibers.

Drilling Procedure

Ordinary high-speed steel drills such as are used for drilling steel, but with slight modifications, can be used for drilling holes up to 3/16 in. diameter in the glass-reinforced plastics. A slight negative rake should be ground on the cutting lip similar to that used when drilling brass. It will be advantageous to use carbide-tipped drills for holes of these sizes provided such drills are obtainable. It is advisable to back out the drill at frequent intervals to clear the chips and avoid burning.

Drills for all holes of 3/16 in. diameter and larger should be carbide-tipped and must be kept sharp at all times for best results. A straight tungsten-carbide has been found to be the most practical grade, due to the conditions of abrasion involved. The flutes of such drills should be highly polished and maximum chip clearance should be provided. The drills should have a slow helix for through holes; a fast helix for blind holes; a 55 deg. point for thin sections and a 90 deg. point for thick sections. It is possible to use both carbide-tipped masonry drills and carbide gun drills for holes ranging from 3/16 to 1½ in. diameter. These drills can be adapted for use in standard drill presses.

After drilling, most holes are usually found to run from 0.001 to 0.003 in. undersize, due to the plastic's tendency to spring back after having been compressed. Should the drill tend to cut oversize, the condition can be remedied by grinding a slight radius at the end of the lip of the drill.

Several other methods for cutting large holes in the glass laminates have been successfully employed. One of the most satisfactory is with the fly-cutter type hole-cutting machines equipped with carbide-tipped tools. A gasket cutter can be used to produce large holes in comparatively thin sheets of glass-reinforced plastic. Large holes can be sawed with circular saw tooth cutters such as are used for cutting holes in sheet metal.

Safeguard Against Splitting

No matter what type of drill or drilling device is used for drilling holes in glass laminates, or the size of the hole being cut, a certain amount of precaution is necessary to keep the material from splitting. When drilling perpendicular to laminations, it is recommended that the work piece be backed up by clamping a block of either wood or metal to the bottom of the plastic. The drill is passed completely through the work before the back-up section is removed. This prevents breaking out and gives a clean, sharp-cornered hole. For other types of drilling, the material should be clamped in a vise or between plates. Then, after the hole has been started in its proper location, a bottom drill with a slow feed should be used.

If a limited amount of duplicate work is to be drilled, an ordinary layout templet can be used for locating the holes. In case there is a large amount of duplicate work, drill jigs will be found to be economical if they are designed with slip bush-

PHOTOS COURTESY OF OWENS-CORNING FIBERGLAS CORPORATION

The end mill used to mill the Fiberglas plastic is faced with tungsten-carbide

ings so that after the work is started they can be removed to reduce the friction on the drill and avoid the high bushing replacement which would result from the abrasive action of the glass-bearing chips between the drill bushing and the drill.

Should the drill run to one side when starting a hole, it can be brought back into proper location by drawing over, just as drills are drawn back into position when working with metals. This must be done before the drill point has completely entered the work.

Boring and Milling

Another method of cutting large holes is to use a lathe, a boring mill, or a milling machine. In such cases, a starting hole is drilled and then is finished by boring to size in much the same manner as in conventional metal machining practice. The carbide boring tools should be so ground that there is no back slope and a maximum of clearance. A side slope of 13 deg. usually will give satisfactory results. The cutting angle should be 55 to 60 deg. In setting up the job, the tool should be set so that the heel of the cutting edge cuts in advance of the point, thus insuring a clean edge free of fins.

Carbide-tipped cutters give good results for all milling work on glass-reinforced plastics. Best results appear to be obtained with a milling speed somewhere between 400 and 800 ft. per min. The cutter blades should be ground to have a slight positive rake. From all indications, the glass-reinforced plastic ruptures ahead of the tool edge when milled at high cutting speeds; the tool edge exerts a wedging rather than a direct cutting action. Thus the tool's edge does not contact the glass and is protected because the wear occurs back of the cutting edge.

When milling at low speeds the plastic material is pushed up to the edge of the cutter; this action forces the cutter to cut the glass by impact. This tends to wear the edge unduly and creates considerable heat. Climb milling, in which the milling cutter cuts down rather than up on the workpiece, reduces the danger of lifting laminations at the edge of the cut.

Slotting should be done with the end mill whenever possible. If a circular cutter must be used, it will be best to use a side cutting mill rather than a plain type, as the side mill gives more chip clearance with subsequently less heating.

For machining operations of this

A carbide masonry drill used to drill a 3/8 in. hole in a laminated plastic part

nature, the cutting speeds can be from 50 to 80 surface ft. per min. A feed of from 0.010 to 0.015 in. per stroke should be maintained. To get clean cuts and a smooth finish, the planing or shaping tool must be set so that the cut is a shearing action from the surface of the work backward and down. A cemented carbide cutting tool with a cutting angle of 36 deg., clearance angle of 30 deg., and a shearing angle of 45 deg. will be found to work well.

Oversize Taps Used

Three fluted or two fluted spiral gun taps made of nitrided or chrome plated high-speed steel having a negative rake of 5 deg. on the front face of the land can be used for tapping. These taps usually are from 0.002 to 0.008 in. oversize as the glass-reinforced plastics exhibit a tendency to close up when the tap is removed. Machine-tapping can be employed, using speeds from 40 to 50 ft. per min. Holes to be tapped should be drilled or bored to leave 75 percent of a full thread.

Threads can be chased in a lathe. When chasing V-threads, the lathe compound feed should be thrown around to 30 deg. and the tool ground to cut one side only.

Band saws are found to be best for general-purpose sawing of glass-reinforced plastics, though all types of metal-cutting blades can be used. Good results are obtained by using a metal-cutting saw with the teeth set to clear one-half the thickness of the blade on each side; 8 to 12 teeth per in.; 21 to 23 gage; and the width of the blade governed by the radius to be cut.

A hole saw used to cut holes in sheet metal can also be employed for glass-reinforced plastics when mounted in a drill press. The speed in this case should not be greater than 2,000 ft. per min.

Punching and Blanking

Both punching and blanking operations can be carried out satisfactorily on glass-reinforced plastic sheets.

When punching, the recommended distance between the hole edge and the edge of the sheet is three times the sheet thickness. The diameter of punched holes should never be less than sheet thickness. Holes smaller than the thickness of the sheet should be drilled, as the sheet may crack during the punching operation. The fit between the punch and the die should approach a sliding fit. A pressure stripper with a slide fit is usually required to obtain clean-edged holes and to keep the punch from pulling up the edge of the hole as it is being removed from the work sheet. About 3 percent of the thickness being punched must be allowed to take care of the laminated material's tendency to yield somewhat when punched. If this allowance is not made, the resulting hole frequently will be somewhat smaller than the punch.

When blanking, it may be found that the edges of the laminations become torn or rough between the surfaces of the material. An effective solution to this problem is to punch the blank slightly larger than is required and then pass it through a shaving die. For this shaving die, it is recommended that a wear resisting carbide material be applied by brazing to a soft steel die body. The punch should be of soft brass, slightly concave on the face, and a sheared fit. When the punch becomes worn, it can be peened oversize and then again sheared in to fit the die as closely as possible.

The stroke of the press should be so adjusted that the punch clears the blank out of the die at each stroke. The blanks should not be permitted to stack up in the die. Shavings of the glass-reinforced plastic dropped between the stacked blanks may cause the material to cock up, tending to separate the laminations in the blanks when they are finally forced out.

In general, die design is about the same as for sheet metal work. Standard press equipment can be used.

Advance Termination Work

CLEARS LARGE PLANT IN 28 DAYS

Rapid disposal of material and equipment used in manufacturing turbo-superchargers permitted the Ford Rouge plant to start on another government contract

ORDERLY and effective plant clearance at the termination of a war contract was demonstrated at the Ford Rouge plant under arrangements made in advance with the Central District, Army Air Forces. Within 28 days after a $100,000,000 turbo-supercharger contract was finally terminated, the plant was cleared of tools dies, fixtures, machines and stock, and re-equiped for production of droppable fuel tanks, a replacement contract.

The system under which the plant clearance was accomplished efficiently and economically is based on pre-determination—advance agreements made between the contractor and the interested government agency.

The clearance of the Ford Plant was so successful that Lt. Col. William Young, chief, plant clearance section of the Readjustment Division, Central District, urges other contractors to study the pre-determination system and adopt it in the future for cutbacks or terminations.

The Ford turbo-supercharger contract involved $100,000,000 with an inventory of more than $3,000,000, consisting of raw materials, work-in-process, special tools, dies and fixtures. Upon receiving word that the contract would be terminated in the near future, Army Air Forces representatives and Ford officials conferred to determine a course of action.

There was a quantity of tools on hand in excess of requirements. Using original procurement lists, which were incorrect as to quantity, the Central District requested Wright Field to determine what excess tools would meet "standby" requirements for other AAF use. A complete inventory was taken on the excess cutting tools and shipping instructions were requested from the Chicago warehouse. Clearance was obtained on the tools, dies and fixtures still in use. Thus, 20 days from the time the Central District received word of the planned termination, it was in a position to take immediate action when actual termination orders came.

Two other manufacturers working on turbo-supercharger contracts were notified and sent men to pick out tools, machines and materials they could use. These were itemized.

Tools and materials not in use were segregated and removed to a special section where they were inspected, listed and packed ready for shipment. During this time, inventories were being made up on forms covering raw materials, cutting tools and work-in-process. Items were listed and costs decided, with the count to be added later.

As much of the production equipment was owned by DPC with AAF sponsorship, clearance of the sponsorship was obtained quickly. In this connection, however, the DPC equipment had attachments, such as motors and switches, which had been purchased under the supply contract with AAF funds. Much of the equipment was useless without the attachments.

The attachment items were listed separately by AAF personnel and transferred without cost to the DPC.

Meanwhile the Central District received its first shipping instruc-

Plant clearance is graphically demonstrated in the "before-and-after" views of the turbo-supercharger plant at Ford Rouge. On this page is a scene of the equipped plant while the $17,000,000 war contract was still being carried out . . .

tions from the Chicago warehouse for the excess cutting tools, and the sale of items picked out by the two other manufacturers was completed.

Inventories of raw materials and various parts were completed by the contractor except for the final count, and a preliminary inventory of the residual property was submitted by the contractor to the Central District.

The termination order came 47 days after the preliminary announcement. All items on the production lines had to be completed, and thus a delay of seven days was necessary before final clearance action could start. During this time, however, inventory lists of raw materials and some parts were completed as to count and cost. They were submitted to the Metals Reserve Corporation.

A scrap day was set aside and the Disposal Board, established specifically to pass on scrapping of surplus tools, dies and fixtures for which no use can be found either for standby purposes or for use by other manufacturers, approved the scrapping of $1,500,000 worth of special tools, dies and fixtures. This was considered a small amount, considering the size of the project. The scrap was disposed of through the contractor's scrap channels, with approval of contracting officers.

RECAPITULATION OF FORD CLEARANCE PROGRAM

Inventory Classification	Date Inventory Received	Value at Dollar Cost	Effective Plan Clearance Date
2-A and 2-B.....	Nov. 3	$397,000	Nov. 27
Cutting tools.....	Sept. 25	98,000	Nov. 28
2-C	Nov. 9	112,000	Nov. 18
2-D	Nov. 11	1,484,000	Nov. 11
Residual.....	Nov. 24	30,000	Nov. 28
	Total	$2,121,000	

Residual inventories were completed and shipping instructions asked of Wright Field. The Ford Company retained the material it wanted, and some material was returned to the original vendors at the latters' request.

Within 28 days from the date of the actual termination order, all residual material had been shipped to storage and the plant was cleared. To summarize the program, the pre-determination work had taken 46 days, and the actual plant clearance only 28 days.

To do this work, the contractor used 75 employees and the AAF 12 men. The contractor was reimbursed for all wages paid for the pre-determination work when the contract was terminated. Post-termination costs were also recovered by the contractor.

In urging all its contractors to adopt the pre-determination system for speedy plant clearance, the Central District reveals that it has more than 700 officers and civilians specially trained to assist in such programs. At least two large manufacturers have already adopted the program.

Principal emphasis is placed on proper costing methods so that inventory costs can be readily obtained and correct inventories made. Faulty inventories present time-consuming bottlenecks.

Contractors are advised to make up inventories of special tools, dies and fixtures, which generally occupy the bulk of the floor space and which can be costed on an over-all basis; then prepare an inventory of raw materials and parts reportable to the Metals Reserve Corporation on a cost basis with the count to be added later; then list work-in-process on the proper forms. Decisions can generally be made on items to be scrapped.

Lt. Col. Young urges contractors to educate their subcontractors on pre-determination methods so that their claims can likewise be handled speedily and efficiently. The Central District has set 30 days as its objective for actual plant clearance. Lt. Col. Young claims this can be achieved providing the necessary pre-determination work is performed according to recommended procedure.

• • • Here is the same plant 28 days later when it had been cleared completely for its new assignment of making droppable fuel tanks. Some of the fixtures were left intact because they could be used in the production of auxiliary fuel tanks

Hirohito's Helpers

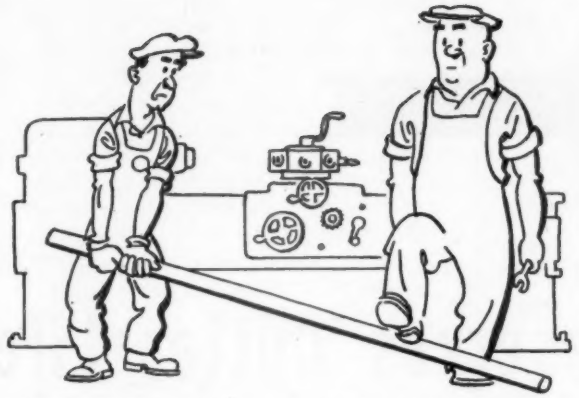
These workers do not mean to aid the enemy; they are simply thoughtless. But their small acts of negligence, repeated a thousandfold, amount to a serious set-back in our war production. Names listed below are purely fictitious, but they typify some of the offenders who unconsciously give indirect help to Hitler and Hirohito. Added together, their daily shortcomings are more destructive than deliberate sabotage. Only they themselves can correct their own bad habits and put the full strength of industry behind our forces at the front. Although the enemy is on the run, the war isn't over yet. Our fighting men will need everything we can give them until the last shot is fired.

TOM TARDY usually punches in late. He'd much rather be on time, but a few minutes longer in bed put him behind schedule, and before he's through breakfast he sees he can't make it anyway. He loses part of his day's work, and has a bad effect on his fellow workers

WALTER WOLFE likes night life. He doesn't see why he shouldn't spend his wages the way he wants. He's right up to the point where his night prowling interferes with his daytime duties. Nobody can hit the ball at 8 a.m. with too many highballs the night before

PEARL PRATTLE can't seem to keep up with her job. Perhaps if she gave a little more attention to the work at hand, this condition would clear up. All feminine fingers are not equally nimble, but a little extra application will usually keep the production line moving

BILLY BULL believes there's no better way to budge a balky chuck than to hit it a wallop with a wrench. He doesn't appreciate the accuracy that has been built into his equipment and the destruction his heavy-handed methods cause. He'd do better to call the foreman



LARRY LONE gets along all right by himself, but he hasn't learned that many phases of manufacture call for team play. Maybe it *is* the other fellow's fault that a job is lagging; but a helping hand at the right moment will get things moving smoothly again

SAM SQUAWK thinks that he is just as good as the next guy and doesn't see why he has to take orders from supervisors. He knows that a good part of a sailor's "boot" training is learning to do what he's told. He should know that shop discipline is important too

MILLY MISSING likes a day off occasionally. She has to get her hair done and do some shopping before the stores are crowded. She loses sight of the upsetting influence of her absences. Someone has to be found to do her work, and that takes the foreman's time

HARRY HAZARD has a good sense of humor but doesn't always use it at the right time. There's no room for horseplay in the shop. It's distracting and a cause of accidents. If Harry would only save his pranks until after working hours the joke would be on the Japs

GEORGE GROWL isn't as bad as he sounds. Deep down in his heart he enjoys his work, but he takes a peculiar pleasure in griping against the plant management and the world in general. If he stopped to think he'd know his grumblings have a bad effect on the shop morale

BOB BOTCHER has trouble getting his work past inspection. A lot of his parts end in the scrap pile. Either he doesn't follow directions, or he reads his mike wrong. Whatever the cause, his machine chews up material at a rate which would gladden Himmler's heart

Proper Sharpening Preserves Cutter Life

BY M. MARTELLOTTI, RESEARCH ENGINEER, CINCINNATI MILLING MACHINE COMPANY

Milling cutters are expensive tools and should be handled with care in order to get efficient cutting action as described in the ninth article of this series

PRODUCTIVITY of a milling machine depends largely on the efficiency of the milling cutter. Best results in both production and cutter life are obtained by sharpening cutters correctly and carefully, and by proper care in their handling and storage. A correctly sharpened cutter requires less power, produces better work and will give longer service than one poorly ground.

In connection with the handling and sharpening of milling cutters, the following factors should be considered:

1. Handling and storage of the cutters.
2. Providing the cutters with the proper clearance angles.
3. Selecting the proper grinding wheels.
4. Proper preparation of the cutting edges.

Milling cutters are expensive precision cutting tools and must be handled accordingly. They should be stored so that the cutting edges will not become nicked. Each nick appears as a flaw on the milled surface unless it is removed from the cutting edge by grinding. Grinding should be necessary only when the cutter has become dulled through normal use, as any unnecessary grinding will shorten the life of the cutter.

When a job is completed, the cutter or cutters should immediately be returned to the toolcrib. If necessary, they should be correctly stored after grinding and inspection. Containers, such as wooden boxes or boards with pegs, are recommended for use in transporting cutters to and from the machine. Cutters in storage should be flushed with heavy oil to prevent the formation of rust. Rust will cause roughness of the face and cutting edges of the teeth, shortening the life of the cutter and affecting the finish produced on the work.

Cutters of the standard type are usually ground by the manufacturer to a clearance angle which may or may not be satisfactory for the particular milling operation on which the cutter is being used. As a general rule, it is desirable to inspect each new cutter and sharpen it to make sure that it has been ground in accordance with the general practice existing in the shop.

The clearance angle should be such as to conform with the accepted values for the type of work being performed by the cutter. If a record is kept of the clearance angle used on each job, it is possible in the future to provide the cutter with the clearance which has been found to give best performance on the same kind of work. This will permit duplicating the performance of the cutter in both operatoin and life.

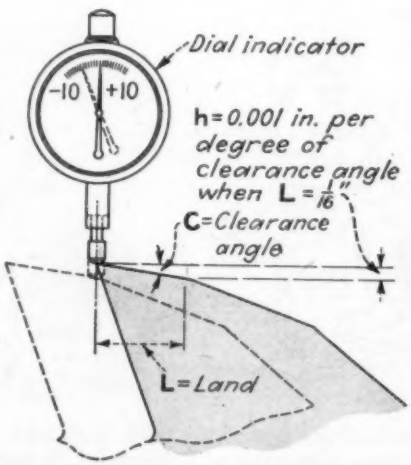


Fig. 45—The clearance angle can be calculated from measurements made with a dial indicator

Effect on Cutter Life

Clearance angles should be checked after each resharpening. Variations in this angle will cause a wide difference in cutter life. By avoiding such variations in the clearance angle, average cutter life may be increased by at least 20 percent and often more.

The primary clearance angle can be measured easily by means of a dial indicator, remembering that for a 1/16 in. width of land, each degree of clearance is equivalent to approximately 0.001 in. on the dial indicator. If the width of land is ⅛ in., the indicator reading per each degree of clearance is approximately 0.002 in. For any width of land, the clearance angle can be calculated from the following formula (see Fig. 45):

$$C = 57.32\frac{h}{L} \qquad (11)$$

where:

C = the clearance angle in degrees,
h = the indicator reading in inches, and
L = the width of the land in inches.

The diameter of the cutter has no effect on this measurement.

Milling cutters are sharpened on grinding machines known as tool and cutter grinders. For accurate work, the machine should be kept in good operating condition. The grinding wheel spindle must be free-running, but the bearings should be adjusted so that there is no end play, which tends to cause chatter. A loose spindle or lack of rigidity in the mount-

ing of the cutter will result in inaccuracy and a poor finish on the cutting edge, due to continuous chatter of the wheel against the work.

While the breaking-down action produced by chatter on the grinding wheel may be offset by using harder grades of grinding wheels, this type of wheel is undesirable because the cutting edge may be burned easily. Burning will unlikely occur with a rigid spindle and cutter mounting because softer and more open types of wheels can be used.

Straight Table Ways Essential

The table ways must be kept straight and true to maintain ease of motion and accuracy in grinding. Some types of tool and cutter grinders are provided with table ways of the anti-friction type, where the worktable is supported by a series of balls on hardened and ground ways. This method of construction insures free motion of the table and high accuracy throughout the life of the machine.

Peripheral milling cutters are sharpened by grinding a narrow land on the periphery of the teeth. This land is inclined with respect to the tangent to the cutting edge by an angle known as the clearance angle. Two methods are available for performing the operation:

1. Grinding the clearance with the side of a cup type grinding wheel as is shown in Fig. 46.
2. Grinding the clearance with the periphery of a disk-type grinding wheel as is shown in Fig. 47.

Wheel Set Below Cutter

In both methods the desired clearance angle is generally obtained by setting the center of rotation of the grinding wheel a predetermined amount below the center line of the cutter (see Figs. 46 and 47), while the cutting edge supported by a toothrest is maintained fixed in relation to the grinding wheel. This will cause the grinding wheel to produce on the back of the tooth a land inclined with respect to the tangent to the periphery of the cutter of a small angle equal o the clearance angle. In Figs. 48 and 49 is illustrated, considerably enlarged, the condition obtaining with a cup and a disk-type wheel respectively. The clearance angle C is usually very small, and the vertical distance H between the center of the grinding wheel and the cutter can be computed by the following formula:

$$H = 0.0087\ D_c\ C \qquad (12)$$

where:

H = the vertical distance between the center of the cutter and grinding wheel inches.

D_c = the diameter of the cutter in inches.

C = the clearance angle in degrees.

The approximate value of H corresponding to a given cutter diameter and clearance angle can be obtained for both cup and disk-type wheels from the chart shown in Fig. 50. This procedure however, is not necessary when using a device known as the *clearance setting dial.* This permits setting up the machine for the proper clearance angle quickly, accurately and directly without using formula or table.

When sharpening profile cutters with a cup-type wheel, a flat surface will be ground on the flank of the tooth and the effective clearance angle will be the same as the desired

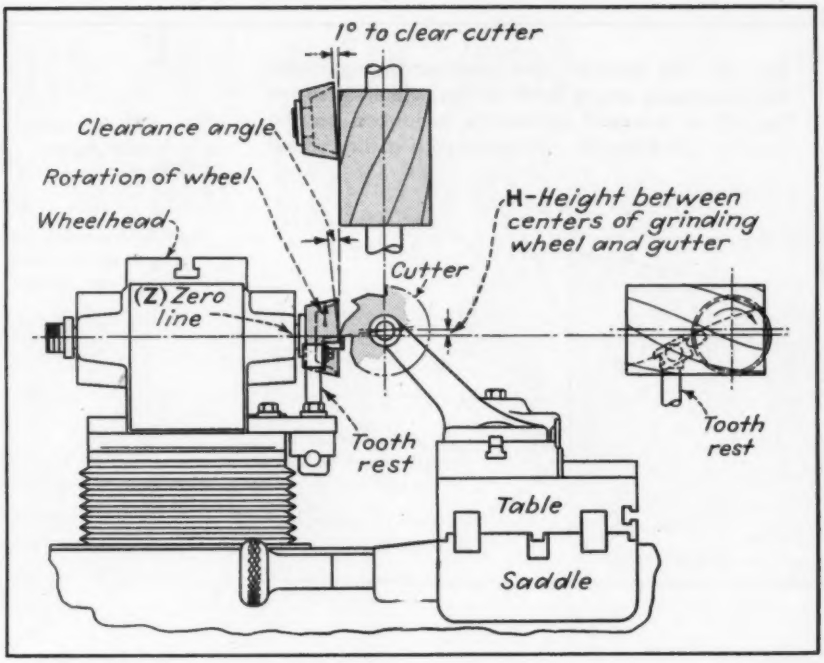


Fig. 46—The clearance angle can be ground on profile-type milling cutters with a cup wheel

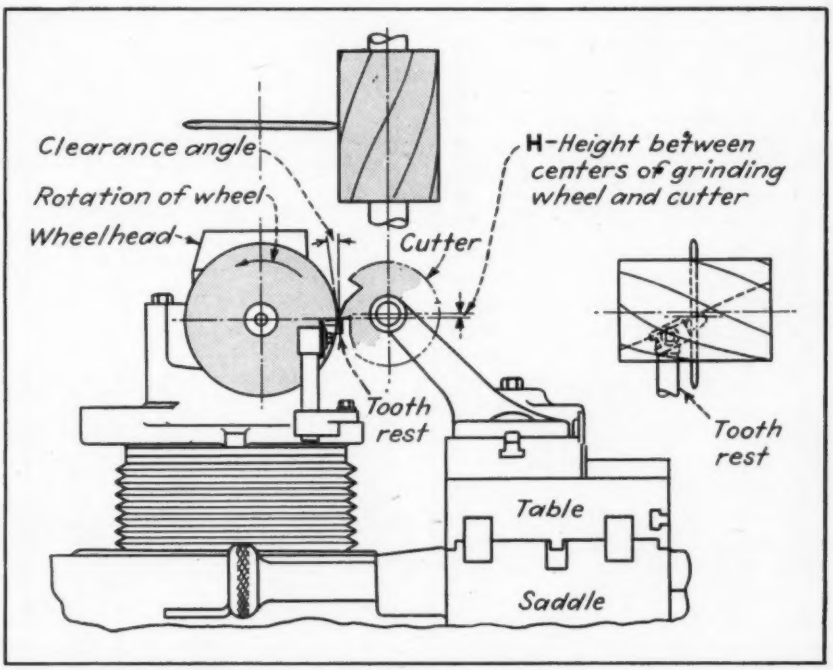


Fig. 47—An alternate method of grinding the clearance on profile-type milling cutters is through the use of a disk wheel

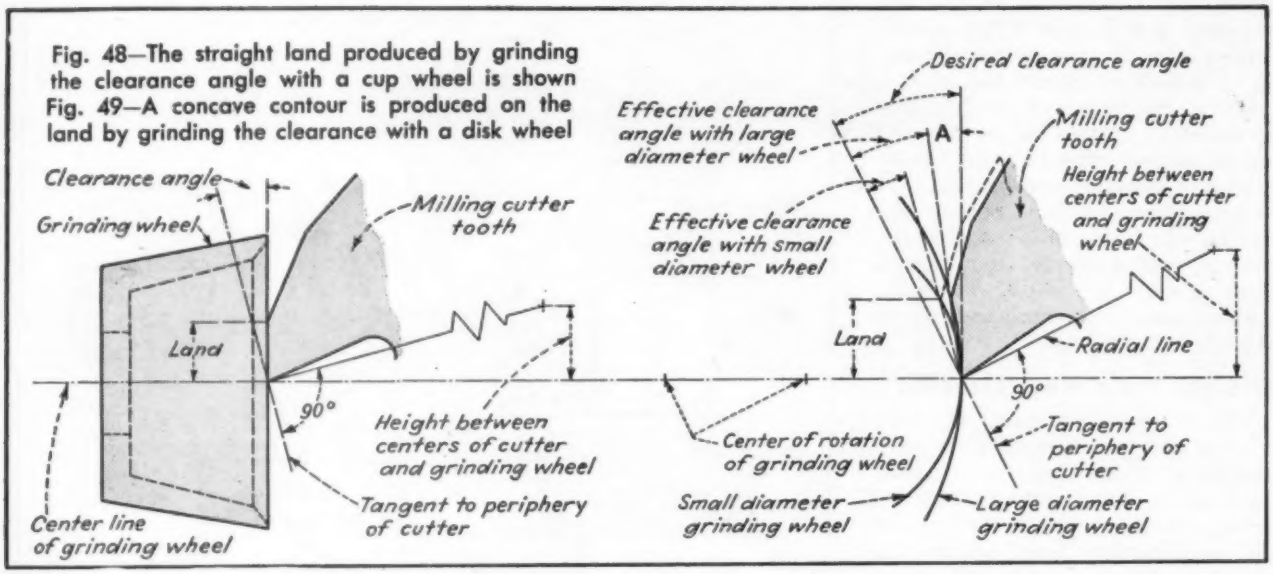


Fig. 48—The straight land produced by grinding the clearance angle with a cup wheel is shown Fig. 49—A concave contour is produced on the land by grinding the clearance with a disk wheel

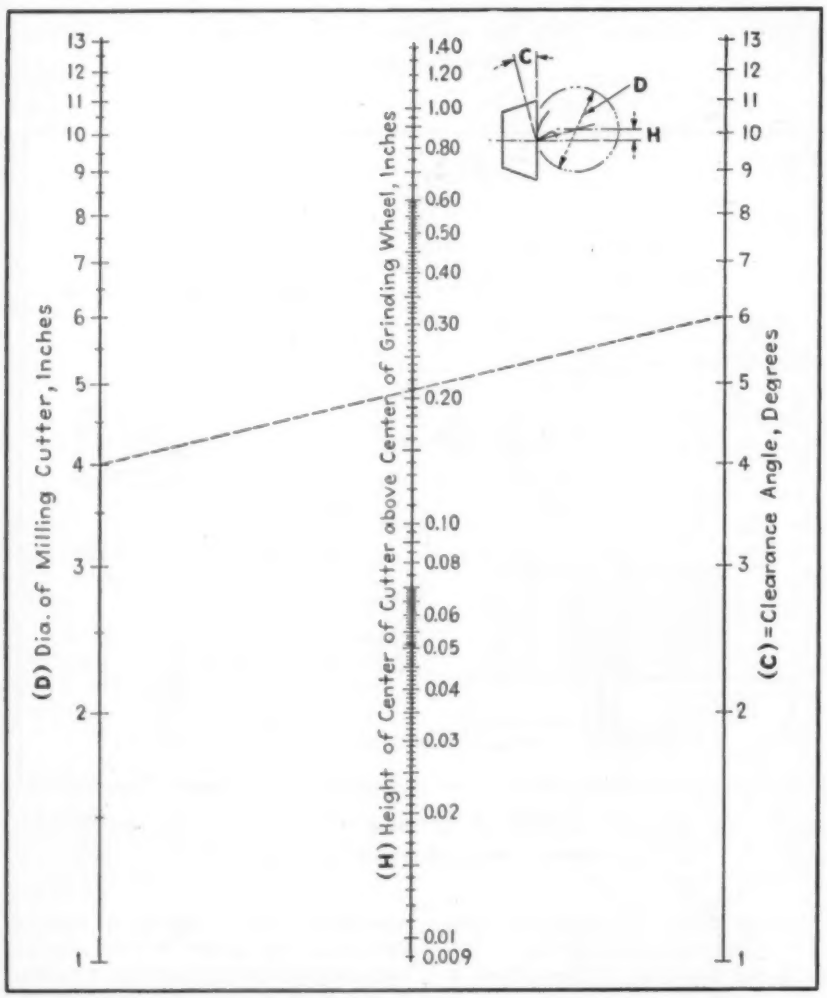


Fig. 50—The alignment chart gives the value of *H* corresponding to give a value of cutter diameter and desired clearance angle. Example: 4-in. diameter cutter, 6-deg. clearance angle; draw a straight line from the point corresponding to 4 on the milling cutter scale to 6 on the clearance angle scale. On the point of intersection on the *H* scale read value 0.21 in. which is the distance between the center of the grinding wheel and the center of the cutter to obtain the required 6-deg. clearance angle

clearance angle. This is shown in Fig. 48.

When sharpening profile cutters with a disk-type wheel, the contour of the land is that of an arc of a circle corresponding to the radius of the grinding wheel. Because of this curvature, the desired clearance angle is obtained only at the extreme tip of the tooth next to the cutting edge, and the effective angle, as indicated in Fig. 49, is smaller than the desired clearance angle.

Difference Can Be Calculated

The difference *A* between these two angles, as indicated in Fig. 49, is usually very small and may be disregarded, but it can be calculated by means of the following formula:

$$A = 57.32 \frac{L}{2R} \qquad (13)$$

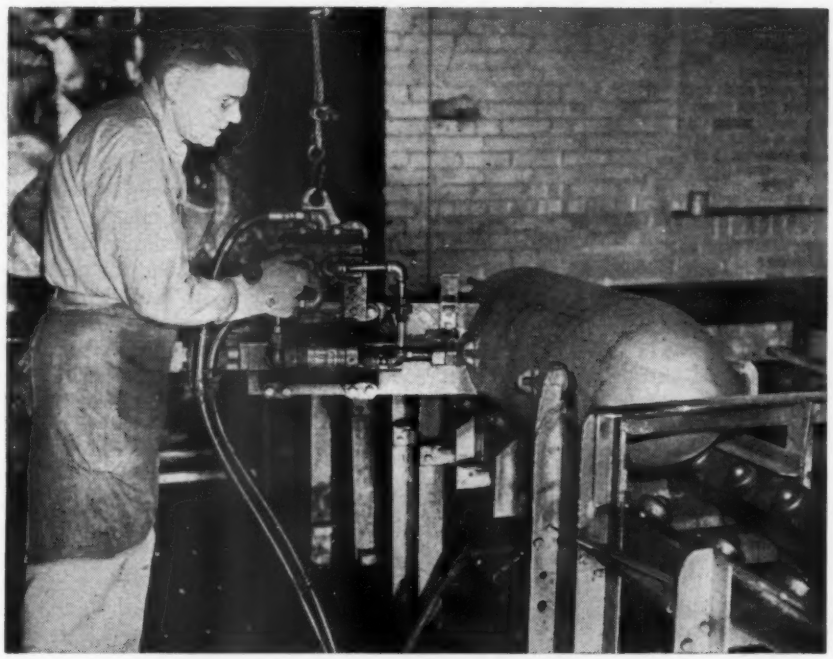
where:

A = the angle in degrees,
L = the width of the land inches, and
R = the radius of the grinding wheel inches.

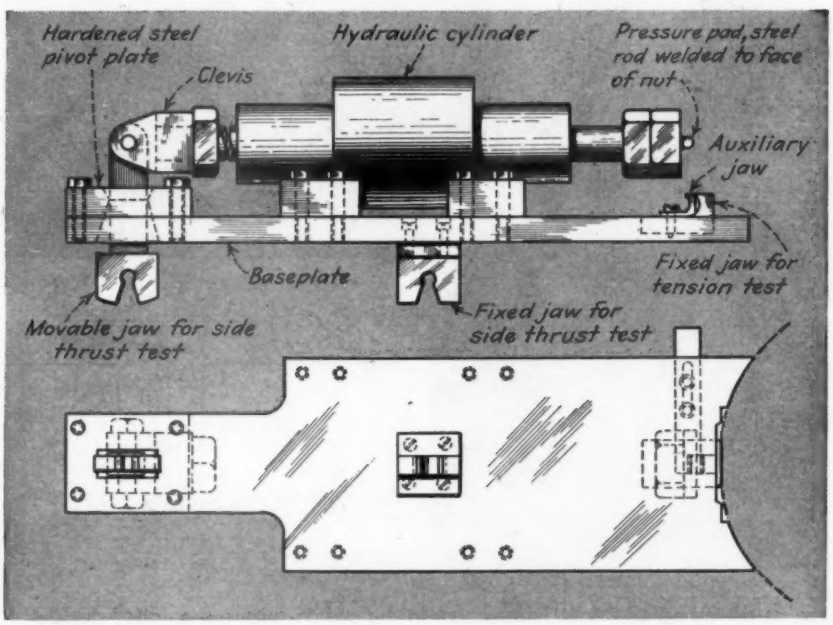
From the above formula, it can be seen that in order to reduce the effect of the curvature of the grinding wheel, it is necessary to limit the width of the land to a minimum value and to use grinding wheels of large diameter. Disk wheels of 6 to 8 in. in diameter are found satisfactory. They permit a closer approximation to a straight outline and consequently to the desired clearance angle.

Part 10 of Mr. Martellotti's series on the use of cup and disk abrasive wheels in cutter sharpening will appear in an early number.

Portable Hydraulic Unit Checks Bomb Lug Welds



The hydraulic lug tester developed for checking lugs welded on 500-lb. bomb bodies is a portable unit which can be connected to the hydraulic power line at almost any required position in the shop. It is controlled by a hand-operated valve bolted to the suspension yoke


Hardened steel pivot plate
Clevis
Hydraulic cylinder
Pressure pad, steel rod welded to face of nut
Auxiliary jaw
Baseplate
Fixed jaw for tension test
Movable jaw for side thrust test
Fixed jaw for side thrust test

This portable lug tester can be used for a tension test on individual lugs, or it can be turned sideways to apply "side thrust" pressure against the two lugs simultaneously

TWO LIFTING LUGS are arc welded to one side of each of the 500-lb. general-purpose demolition bomb bodies being manufactured for the Ordnance Department of the U. S. Army by the Quick Meal Division of the American Stove Company. A third lug is welded on the opposite side. Inspection specifications for these bomb bodies require that each of these lugs be tested after welding with a tension of 6,000 lb. and a side thrust of 1,800 lb.

A simple, relatively inexpensive lug tester has been developed in the Quick Meal Division plant for applying these specified loads to each of the lugs on each bomb body. This tester is a portable hydraulic unit suspended by a cable from the ceiling of the machine shop. Hydraulic pressure for operating this unit is obtained from the 325 lb. sq. in. hydraulic system in the machine shop which provides hydraulic power for bomb boring and tapping machines. A two-way, hand-operated valve on the yoke supporting this unit is moved by hand to apply pressure on either side of the double-acting Hanna hydraulic cylinder which provides power for the tester.

A "tension" test on a lug is performed by fitting the fixed tension test jaw on the end of the baseplate under the lug to be tested. This brings the shaped surfaces against the body of the bomb. Then, when hydraulic pressure is applied to the cylinder through movement of the valve by the operator, pressure of the pad on the end of the piston against the body of the bomb makes the fixed jaw pull against the lug being tested. To reduce wear on the fixed jaw as much as possible, a small auxiliary jaw is mounted in front of the fixed jaw and clamped in place with two small screws.

For the "side stress" test, the tester is turned sideways to the bomb body and the fixed and movable jaws under the baseplate are brought into contact with the two lugs on one side of the bomb. Pressure is applied alternately to each side of the piston in the hydraulic cylinder, thus applying pressure on each side of the two lugs.

Recommended Grinding Practice For Round and Concentric Holes

BY STUART ST. JOHN, THE HEALD MACHINE COMPANY

Inability to meet requirements for close tolerances is often traceable to simple mistakes. It pays to make sure that the simple things are done properly

MANY OPERATORS are under the impression that a hole that has been ground must be fully round and concentric. This is a half truth. It is true that an internal grinding wheel will produce a hole that is round and concentric in any part that may be held in the machine. Whether the hole is equivalent to this ideal condition when it is removed from the machine and tested, is an entirely different matter.

The method of holding the part, the sequence of operations and even the balance of the part and holding device, may affect the final result. If a part is distorted by uneven or excessive pressure of the holding device, the hole will not be round; and if the part is not accurately centered with the outside diameter, the hole will not be concentric.

Since all types of chucks will distort a piece somewhat, depending upon the thickness of the wall, it is essential to select the right chuck. It is not feasible to lay down hard-and-fast rules to cover all internal grinding jobs, but the following characteristics of holding devices should be taken into consideration.

If roundness and concentricity need be held only to 0.003 in. total indicator reading, and especially if a variety of parts are to be run in small lots, a three-jaw self-centering chuck will suffice if the thickness of the part body is sufficient to resist the chuck pressure.

When the limits are about 0.001 in. total indicator reading, a sliding jaw collet chuck may be used.

For tolerances of 0.0002 in. total indicator reading, a diaphragm chuck will do the job, provided the outside surface is held to a tolerance of plus or minus 0.00025 in.

If still closer tolerances for concentricity must be met, the grinding should be done on a centerless internal. The hole is bound to be concentric, for the wall thickness cannot vary. If the piece is distorted in grinding by the pressure of the rolls, it will spring back to shape when the pressure is removed. By taking advantage of the centerless principle which permits relocation without error, the piece may be re-chucked for other internal operations.

Although most designs of work-holding fixtures provide for accurate centering, some do not. To assure that the finish ground hole will be concentric with the outside locating surface, it is advisable to grind the locating surfaces of the chuck after

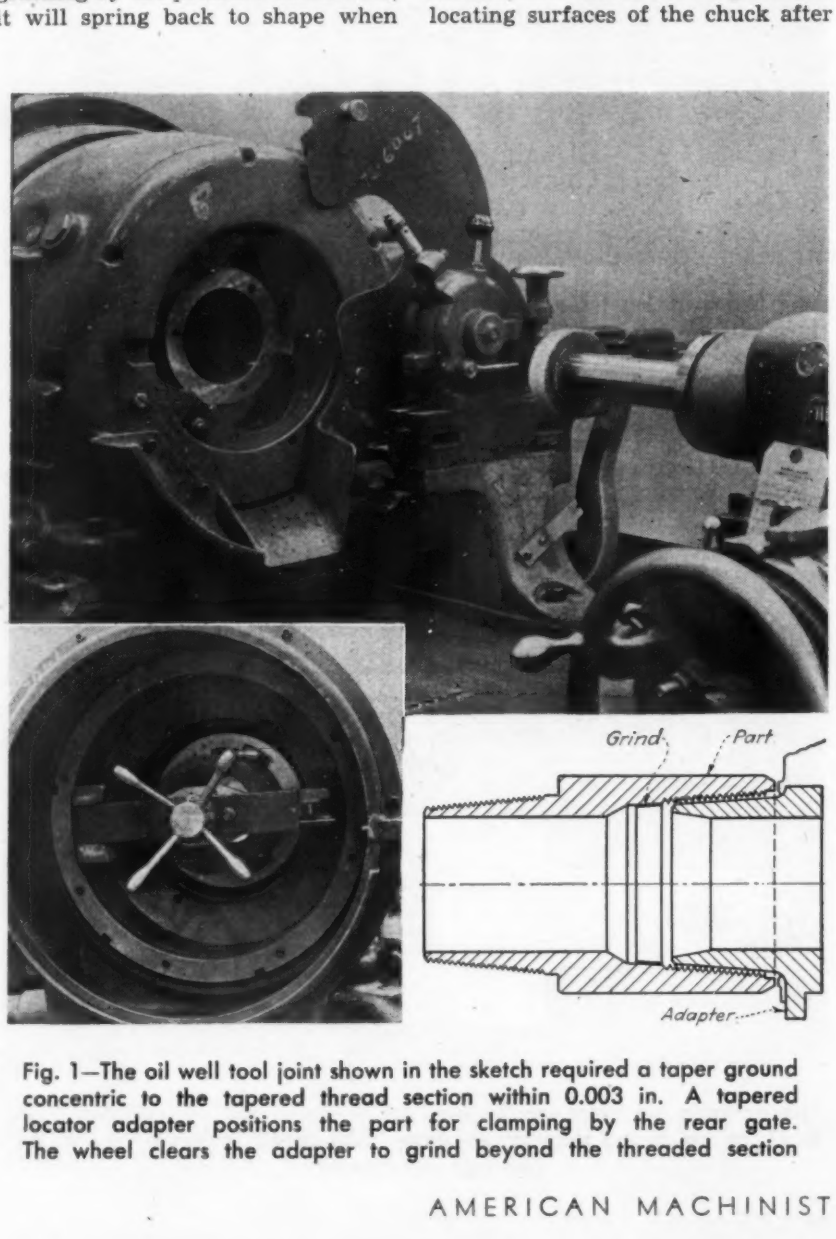


Fig. 1—The oil well tool joint shown in the sketch required a taper ground concentric to the tapered thread section within 0.003 in. A tapered locator adapter positions the part for clamping by the rear gate. The wheel clears the adapter to grind beyond the threaded section

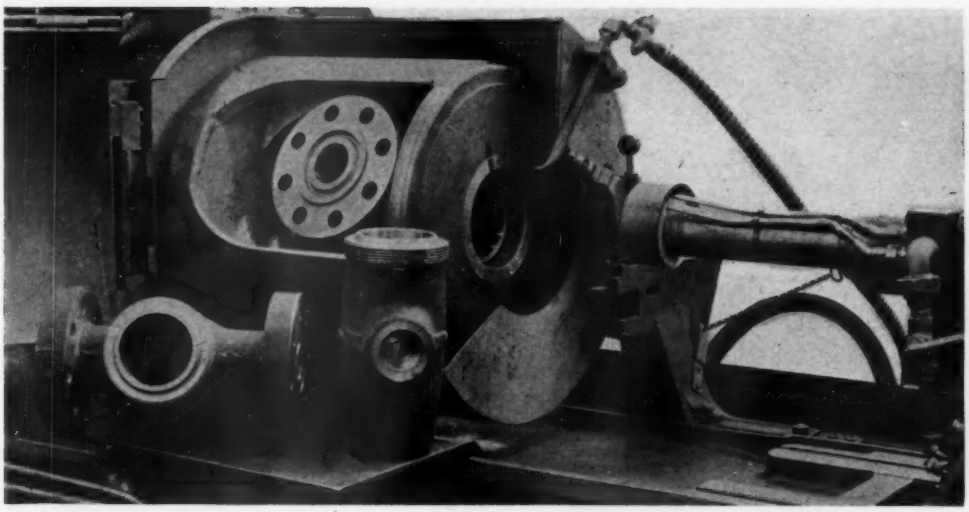


Fig. 2—This valve gate body is located from the thread section seen at the top of the up-ended piece. This is held by a front end adapter ring; the back end is supported by an end clamp

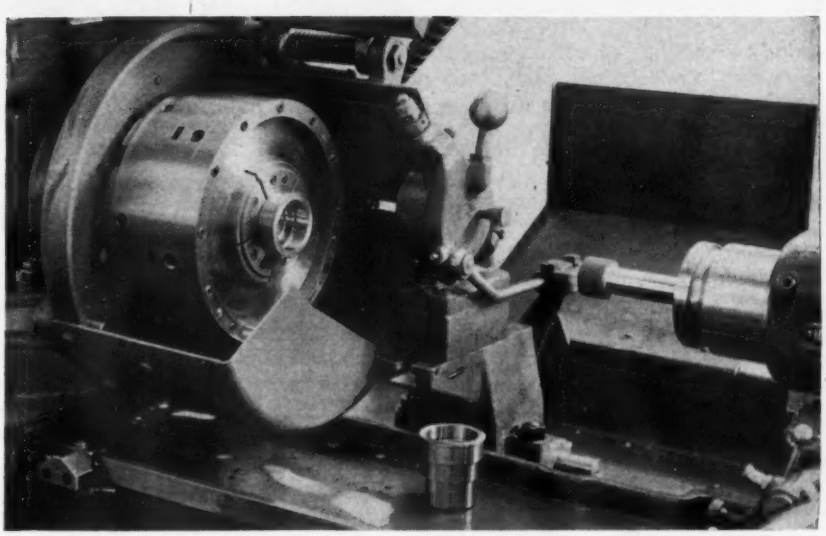


Fig. 3—The three-step part is held in a double diaphragm chuck to assure maximum concentricity. The diameters are accurately ground by provision for transverse indexing

the fixture has been mounted on the machine, and as often thereafter as they become worn in use. This is an elementary precaution which is very often overlooked.

Distortion and consequent out-of-roundness often result from failure to provide accurate locating surfaces in the preceding operations. Typical of these common faults are outside cylindrical locating surfaces which are out-of-round, or tapered. A distorted hole may also result if the end of the piece is not square with the axis when an end clamping fixture is used.

Inaccurate or out-of-round work may be produced, even though it was properly chucked with enough pressure to keep it from moving, yet not tight enough to cause distortion.

One cause would be a work piece or holding fixture which is out-of-balance. A counterbalanced fixture will correct that trouble.

Distortion will result if the piece is over-heated during grinding. An adequate supply of coolant properly directed will usually prevent this.

Design of Holding Fixtures

When one inside cylindrical surface must be concentric with another inside surface, it is necessary to locate from the inside of the piece. Often this presents a problem in fixture design to avoid interference with the grinding wheel. A case in point is the oil well tool joint shown in Fig. 1. The taper surface must be concentric with the adjoining threaded section within 0.003 in. This is not excessively close concentricity, but to get it the part must be located radially from the threaded portion.

If the job were to be done on a machine with a conventional workhead spindle, the required front adapter location would involve the use of a fixture having too much overhang. The problem was solved by using a machine with a hollow workhead spindle which carries the entire piece inside the spindle.

The fixture designed for this job is shown in place in Fig. 1. It is loaded from the rear. The part is supported at the rear and clamped by a swinging latch-locked gate. At the front, the part is supported and located by an adapter which is attached to the front of the spindle.

The tapered seat is ground by means of a cam-controlled hydraulic cross-slide that carries the main wheelhead cross-slide. Cams are also utilized to retract the slide so the wheel will clear the adapter and to true the wheel to the required taper.

This method gives the accuracy required and even production rate.

The gate valve body shown in Fig. 2 must have its 10 15/16-in. long cross-bore ground concentric with its threaded outside diameter within 0.004 in. total indicator reading. It is located radially from the threaded O.D. by an adapter ring in the front end of the balloon fixture, and is clamped endwise from the rear. Squareness with the end surface is within 0.003 in. and the ground diameter is 4.8755 to 4.8745 in.

Transverse Indexing

The part shown in Fig. 3 has three holes in line, each of which must be concentric with each other and with the outside diameter. It is held in a double diaphragm chuck which will produce a degree of concentricity between a locating O.D. and a ground bore which can be exceeded only by centerless grinding.

The three bores of 2.085 in., 1.5156 in. and 1.387 in. diameter are ground in a single setting by means of a handwheel operated cross-slide under the workhead. After grinding one bore, the workhead is indexed to position for grinding the next. Exact indexing is obtained by a 4-position stop on the cross-slide.

When two or more internal sur-

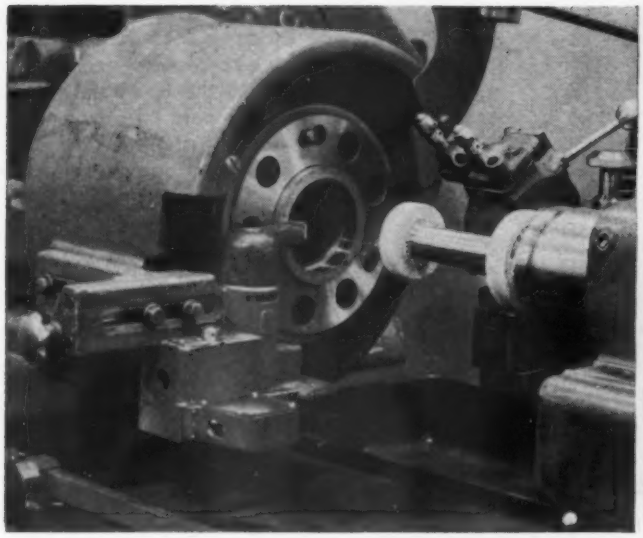


Fig. 4—Propeller cam mounted in a pot-type fixture for grinding. Concentricity of the two ground diameters is assured by the multiple wheels mounted on the quill

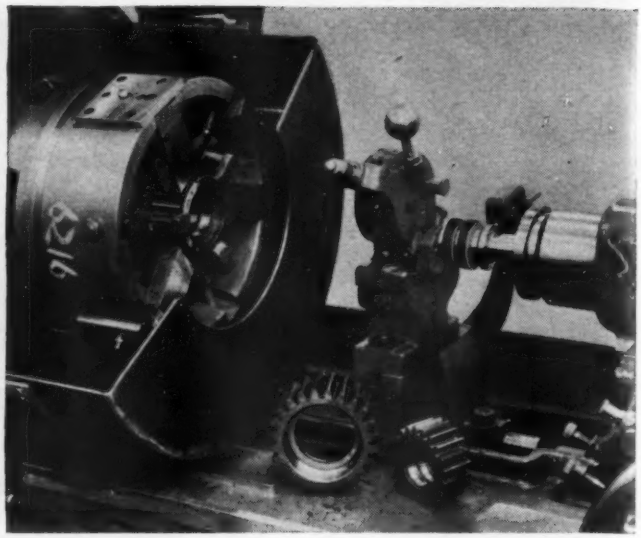


Fig. 5—The gears are ground on two surfaces and two sides of the internal lip with the double wheel. The double-wheel set-up is then replaced by a single wheel

faces must be ground to a high degree of concentricity, production can sometimes be increased by grinding all holes simultaneously with two or more wheels mounted on a single quill, in a single set-up. It is also a quick way to assure accurate lateral location of surfaces to each other.

The propeller cam shown mounted in the grinder in Fig. 4 has one bore 3.750 in. dia. at one end and one 4.675 in. dia. at the other which must be closely concentric. It is held in a pot-type fixture from a bevel at the rear and a shoulder at the front by two locating plates. The front locating plate also clamps the cam endwise by means of studs and nuts.

The two holes are ground simultaneously by the two wheels mounted in tandem. Since the wheels are trued to the correct relationship as to diameter, it is necessary to gage only one of the holes.

Axial Indexing

The steel part shown in Fig. 6 has three surfaces which must be finished to a high degree of concentricity and accurately located in relation to each other and face of work. The surfaces to be ground are an inside diameter of 9.635 to 9.640 in., an adjacent annular groove of 10.112 to 10.117 in., another inside diameter of 10.010 to 10.015 in. adjoining the groove on the other side and two radii of 3/32 and 5/32 in. blending the groove into the surfaces.

The part is held in a ring-type fixture located from the O.D., and held against the rear face by three straps. To secure sufficiently close concentricity and location of the surfaces, three wheels are mounted on a special sleeve-type wheelhead. The two straight facewheels are trued simultaneously with a double diamond truing device, while the third wheel is formed by a hand-operated radius dressing attachment.

The two straight holes are ground with a short reciprocating stroke. The table is then moved forward against a barrel stop and the groove is ground with a plunge cut by feeding the work to the formed wheel.

The diameters are ground concentric with the locating surface within 0.006 in. indicator reading.

The gear shown in Fig. 5 has five internal surfaces, three of which must be ground concentric. The surfaces consist of two 2.4509 in. inside diameters separated from each other at the middle of the bore by a 2.2105 in. inside diameter lip. Both the sides and the inside diameter of the lip must be ground.

The two sides of the lip and the two straight holes are ground by straddling the lip with the two grinding wheel arrangement shown in Fig. 5. In the first operation they are rough ground with a plunge cut. Another plunge cut finish grinds the two sides of the lip and semi-finishes the straight holes. The straight holes are then finish ground in a reciprocating cut. Finally, the inside diameter of the lip is finish ground with a single wheel which is substituted for the double wheel set-up.

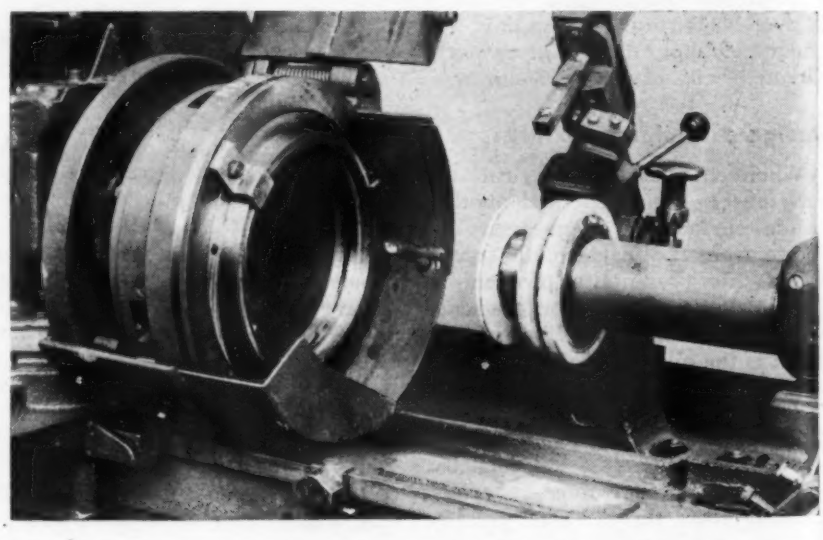
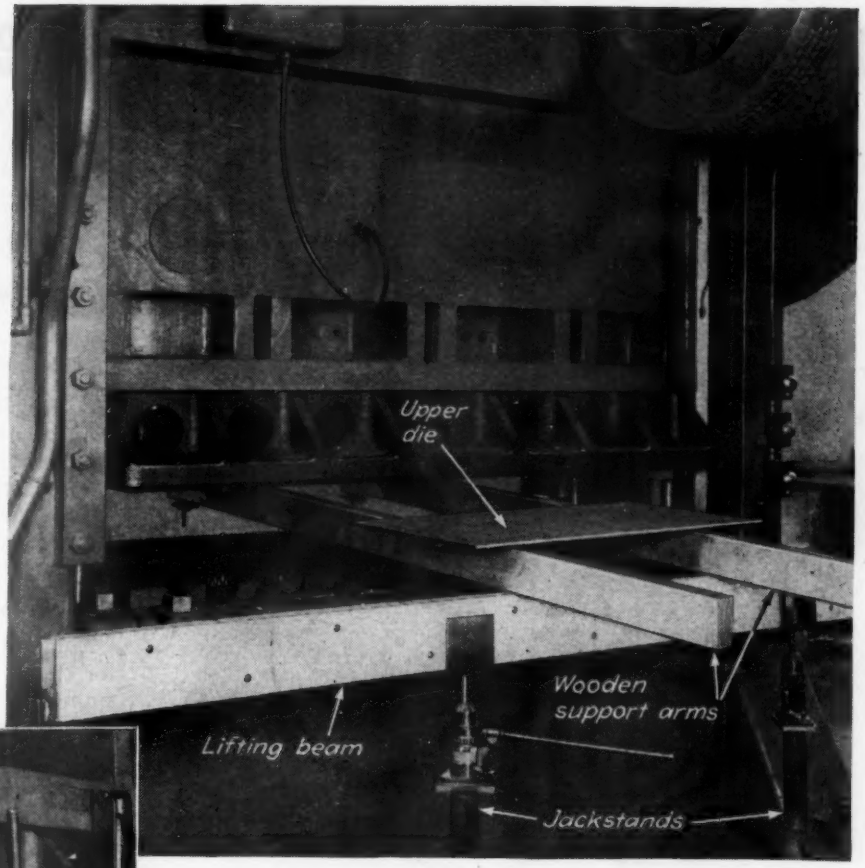
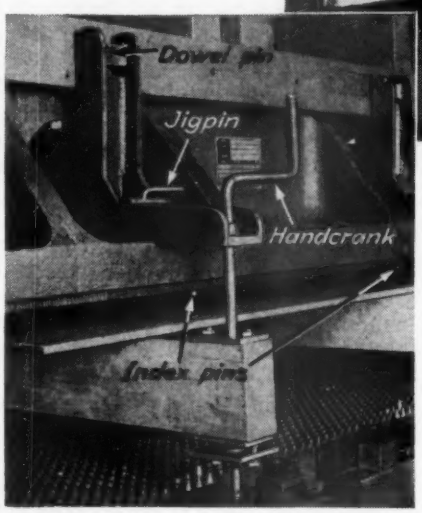


Fig. 6—The two back wheels on the quill grind simultaneously to assure concentricity. The table is then moved forward to a barrel stop and a groove ground with the front wheel



Placing heavy dies in position on a punch press by use of jack screws and lifting the ends alternately by hand has been superseded at Northrop by a handling fixture which furnishes positive support until the dies have been locked in position



Fixture Facilitates Positioning Of Large Punch Press Dies

BY K. B. JAMISON

TOOL DEVELOPMENT AND RESEARCH GROUP, NORTHROP AIRCRAFT, INC.

Methods used formerly in setting heavy dies in place in punch presses have been discarded in favor of a handling fixture which reduces hazards of damage and injuries to hands of workers

THIS HANDLING FIXTURE was designed by Northrop Aircraft, Inc., builders of the Black Widow P-61 fighter and creator of the Flying Wing, to facilitate installing and removing the upper halves of large punch-press dies. Prior to this development several means were tried, such as jackscrews and prying or lifting up one end of the die at a time. These methods required at least one hour's time of two men and since there was no positive support for the heavy die there was considerable danger of smashed fingers and damaged dies.

The two views, one of each side of the press, show the die handling fixture in operation. In the inset, the fixture is shown positioned on the ram of the press by dowel pins, after which jigpins are dropped into place. The assembly is then secure until the jigpins are removed. Index hole patterns, spaced at intervals to accommodate various die lengths, are all that is required on the press, the hole patterns and fixures being jig-drilled to insure interchangeability.

The jackstands and lifting beam are positioned as shown in the larger illustration. The upper die is then placed on the wooden support arms and in close relation to the index pins in the ram. The die is then elevated into place by the jacks and handcranks, one of which is shown.

The index pins in the press are easily engaged by the die because of the flexible nature of the supports. The necessary screws are then installed to hold the die in place.

This device has been in use for a year, and 1½ man-hours per set-up have been saved compared to the time required by the old methods. The entire fixture, with the exception of the hydraulic jacks, was made of scrap materials available in the plant.

Spline Gages Hold Close Tolerances

Unable to procure involute spline gages immediately, a Westinghouse plant used equipment on hand to make its own gages

Six-tooth involute spline gages. The tapered plugs were cut approximately to size and then calibrated to the exact size. Note the annular grooves denoting the tolerance limits. From left to right: the work-tapered plug, "go" and "not go" rings, and mastered tapered plug

BY B. P. ASTLEY AND A. S. McCLENAGHAN

EAST SPRINGFIELD PLANT,
WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY

A THREATENED BOTTLENECK in checking involute splines was overcome at the East Springfield plant of Westinghouse Electric & Manufacturing Company by the design and development of "homemade" gages. Requirements involved the accurate checking of two sets of involute splines, a six-tooth and a ten-tooth, external and internal, so that they could be interchangeable with each other and with similar parts made by other manufacturers.

Reliable gagemakers specializing in the type of equipment needed reported that they could not make deliveries until months after production was scheduled to be in full swing. Unless proper gages were on hand at the start of the job, the plant would be faced with producing many inaccurate parts and thus jeopardizing the quality of the finished machine.

In preparing the "homemade" gages with equipment available in the plant, the problem of maintaining close tolerances was considered. By eliminating standard gagemakers' tolerances and reducing wear allowances it was discovered that work could be performed to even closer limits than were actually required. Furthermore, better fits between mating parts were obtained than would have been possible with the conventional "go" and "not go" gages.

Tolerances Held Closer

Total tolerances on tooth thickness for both the six- and ten-tooth splines were 0.0011 in. on the internal splines, 0.0021 in. on the external splines, and 0.0002 in. between them to assure one sliding into the other. Although the tolerances were small, it was decided after some experimentation to hold to only 0.0011 in. on the external and internal splines to achieve the best possible fits between mating parts.

To expand the useful life of broaches and hobs, it was decided to cut the gages as close as possible to the limits allowed and then calibrate them exactly to the limits. Buckingham's Tables were used in working out the dimensions over pins of the proper size for both splines.

Proper equipment was necessary to cut the gages. The gear-cutting department had a small hobbing machine and, what was more important, a hob of the correct pitch. Some blanks were made out of ordinary machine steel, having a working length of 3½ in. with sufficient extra length to allow the hob to run out. These were used to set up the hobber. The actual gages were made to the same length but with the end turned to a standard gage taper for inserting into a handle. Made of high-grade die steel, the gages were turned and ground from square stock to minimize the danger of warpage during the hardening process. The blanks were normalized before the teeth were cut.

Master Gages Are Cut First

By shimming the supporting arm, and by trial and error methods using the machine-steel blanks, the hobbing machine was set up to cut the

six-tooth spline with a total taper on the 3½ in. length of approximately 0.003 in. A few of the die-steel blanks were then cut at this setting. These gages had the complete range included in their taper, from just below the smallest size of the external spline to a little above the largest size of the internal spline. They were to be master six-tooth spline gages.

The machine was then reset, again by trial and error, to cut a total taper of about 0.0015 in. and the working gages were cut at this setting.

Electric Furnace Used

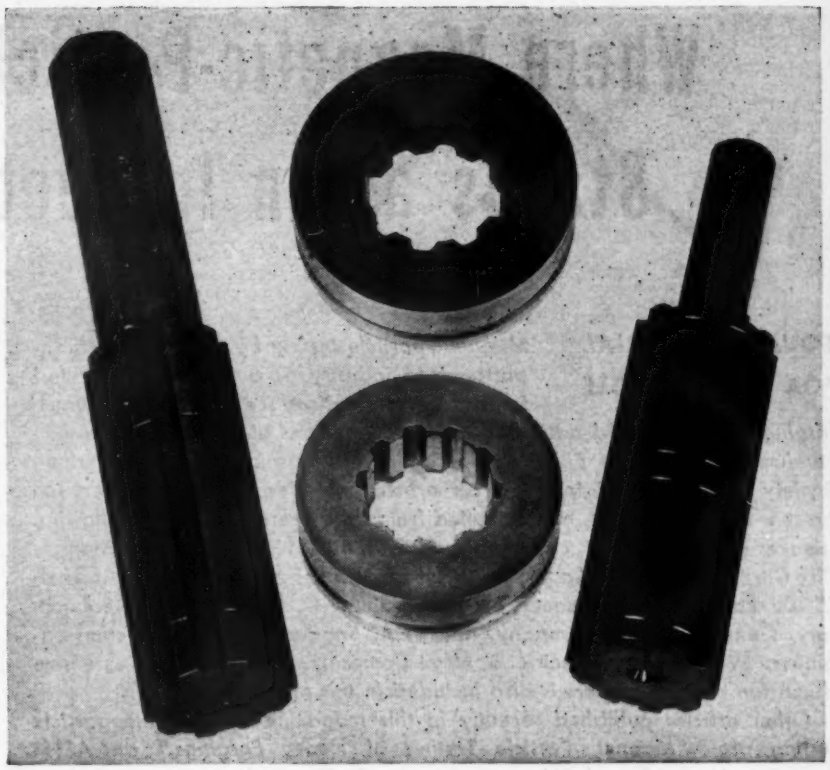
All the die-steel gages were hardened in a controlled-atmosphere Ammo-gas furnace. This electric furnace hardened the parts without distortion and with no accumulation of scale on the working surfaces. Consequently, the gages did not need a finish grinding.

Using proper pins, each gage was carefully measured and small annular grooves were ground at the gaging points. Four such grooves were made on the master plugs, marking the low and high limits of the external spline and the low and high limits of the internal spline. This was the most exacting part of the gage making; the measuring pins had to be straight and accurately ground to the right size. Measurements were taken on a supermicrometer to insure accuracy. Tooth spacing was checked on a comparator and by measuring over two adjacent teeth around the gage.

Milling Machine Meets Needs

The same procedure was used in making the ten-tooth spline gages out of soft blanks of machine steel and die steel. The gaging length was made 4 in. long. Another problem arose when it was discovered that neither a hobbing machine of large enough size to cut the gages nor a hob of the right pitch was available. This was met by making a layout of the tooth form at about 20 times the actual size, and then preparing a form cutter from the layout. A comparator was used to check the cutter's correctness. Then an accurate milling machine was set up with an indexing head, and the ten-tooth gages were cut. This set-up facilitated control of the taper much better than that accomplished with a hobbing machine.

This completed preparation of taper spline gages for checking internal splines, but gages for the external splines were still needed. Thus broaches for the two splines were drawn through blanks and the smallest broach for each size selected. Ring blanks were made, again using square die stock, and the selected broaches were drawn through them. They were heat-treated and finish ground on the outside diameter and faces. The size was determined by subjecting them to tests on the master plug gages.



Ten-tooth involute spline gages. Made to the same design as the six-tooth gages but employing a different method of manufacture. From left to right: work-tapered plug, "go" and "not go" rings, and master tapered plug

There was little control over the finished size of these ring gages but the fact that the smallest broaches were used, plus the slight contraction caused by heat-treatment, resulted in "go" ring gages.

A few "not go" ring gages were made by carefully chrome plating the "go" rings until they were brought down to the required fit on the master plugs. The "not go" gages are seldom used because by working to a good fit on the "go" gages, it curtailed the possibility of going over the high limits and encroaching on the internal spline tolerances. This also produced the best fit possible between the mating parts, since the broaches are normally cutting from the middle to the top limit of their range.

Plugs Wear Well

All the gages prepared in this project have been used in various departments in the Westinghouse plant and some of the company's subcontractors' plants for almost a year. The plugs, because of their slight taper, have not shown any wear as yet, while the rings show a slight tendency to wear. A close check is kept on these gages with the masters, and at the slightest signs of wear, they are discarded. As many as are needed can be made up in a short time and this has made it relatively easy to meet gaging problems as they arise without the necessity of facing prolonged delays in the delivery of such equipment from outside sources.

Gages May Be Calibrated

The experience gathered in designing and making these gages has demonstrated that with increasing restriction of tolerances, there may be many instances in the future where, after subtracting gagemakers' tolerances and wear allowances from the total tolerances, not enough is left to successfully produce the parts on a production basis. In these instances it may be possible to make the gages not to a definite dimension, but rather as close as possible to it. They can then be calibrated so as to give the machinist the full tolerance with which to work. Extreme care will have to be used in providing a wear-resistant gage that can be easily and quickly rechecked.

Where Magnetic-Particle Testing Stands as an Inspection Tool

SOURCE MATERIAL FOR THIS ARTICLE *Magnetic-particle testing has assumed such importance to industry as a non-destructive test for surface and subsurface defects in castings, forgings and machined parts, that over 400 persons attended a symposium conducted recently in Philadelphia, under the auspices of the American Society for Testing Materials. This article, intended as a report on the present stage of the art, was compiled from data presented by the following speakers: A. V. deForest, chairman, and C. E. Betz, vice president of Magnaflux Corporation; H. H. Lester, principal physicist of the Watertown Arsenal; C. L. Frear, material engineer, Bureau of Ships; C. J. Boyle, Works Laboratory, General Electric Company, and E. A. Snader, laboratory section engineer, Westinghouse Electric & Mfg. Company. Some of the extensive discussion of these papers is also included in this article.*

Other articles published recently in this magazine on magnetic-particle testing are: "Magnetic-Particle Testing of Heavy Forgings," an ASTM tentative standard, and "Magnetic-Particle Testing Stations Reveal Surface Defects Rapidly," as used by Jacobs Aircraft Engine Company.

If only a small critical section of a large assembly needs examination, localized magnetization can be secured with a magnet. Here turbine blades are being checked for cracks at the vicinity of the lashing wire

MAGNETIC-PARTICLE TESTING is a recognized method for locating invisible surface and subsurface defects in castings, forgings, machined parts and weldments. The process enjoys wide use, particularly in the automotive, aircraft, ordnance, shipbuilding and railroad fields. Army and Navy specifications call for its use. Tentative standards for procedure in magnetic-particle testing of steel castings and forgings have been issued by the American Society for Testing Materials. In short, during the fifteen years of commercial development, which has been intensified by war requirements, a great deal has been learned about application of this non-destructive test for imperfections in magnetic materials.

The principle of magnetic-particle testing is simple: discontinuities in the metal such as cracks, voids and inclusions give rise to localized leakage fields when the object is magnetized, and these discontinuities can be made evident by attraction of fine magnetic particles to the leakage fields. The build-up of particles (iron or iron-oxide powders) at a discontinuity is known as an "indication."

Although magnetic-particle testing is currently used to inspect many thousands of pieces every day, the method is not an exact science, and it may never be that. For detecting surface cracks, the method is simple, effective, inexpensive, highly sensitive, does not require a high degree of skill, and lends itself to mass production or the inspection of a single piece. Objections to the method center in undue prominence that may be given to minor, or harmless, surface discontinuity and the wasteful rejection that can then occur when used by inexperienced personnel, or when inspectors are held to too rigid specifications. Nevertheless, the inspection procedure is recognized as one of the best methods available for detection of surface defects.

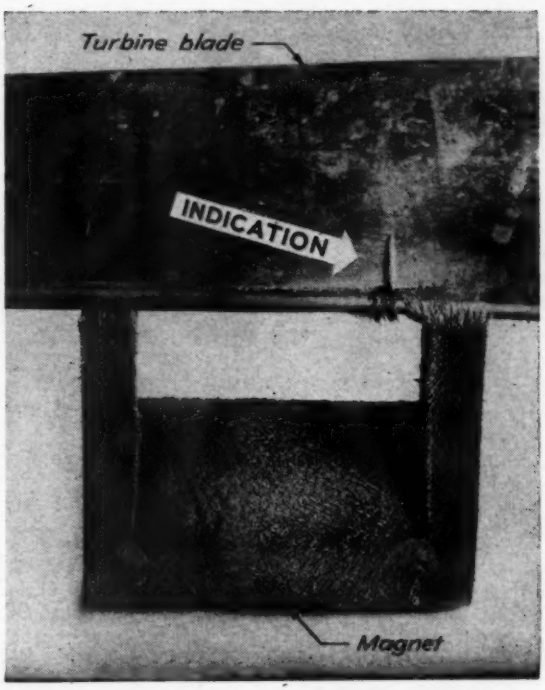
Sub-surface defects are in a different category. Evidence of structural irregularities near the surface of the metal are revealed quicker

and cheaper than by radiographic inspection. The indications, or powder patterns, are generally distinguishable from those arising from surface defects. On the other hand, it is difficult or impossible to ascribe these indications to a specific sub-surface defect. Bearing this in mind, some idea of the problem of identifying sub-surface defects is evident from the list of defects which may occur:

1. Crack-like defects, such as:
   (a) Cracks
   (b) Tears
   (c) Unfused sections along weld interfaces
   (d) Incomplete penetration
   (e) Laminations in wrought materials (examined on cut section)
2. Inclusions, such as:
   (a) Sand or rounded slag masses
   (b) Dispersed slag or sand
   (c) Slag streamers
3. Voids:
   (a) Gas Cavities
      1. Spherical
      2. Elongated
      3. Multiplicity of fine cavities (spongy metal)
   (b) Pipes and laminations (located by this method only when they come to surface at end of piece)
      1. Sharply defined—may be branched
      2. Centerline porosity (spongy metal)

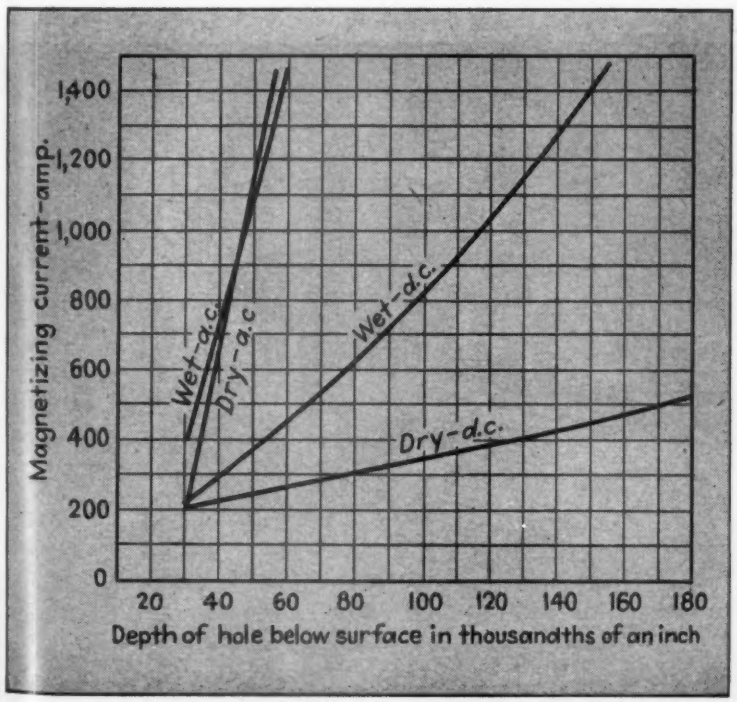
Some of the above divisions, such as spherical gas cavities and rounded slag inclusions, often do not yield distinguishable patterns. Others, such as cracks and laminations, yield patterns only when favorably oriented with the direction of the magnetic field.

The reason for the difficulty in ascribing distinctive pattern characteristics to sub-surface defects lies in the many variables that affect pattern formation. These are flux density, depth beneath the surface, orientation with respect to the magnetic field. Under the influence of these variables, indications for cracks, tears, elongated gas cavities, many pipes and some types of centerline porosity appear as diffused bands, which are applicable to any one of these defects. Similarly, it is difficult to distinguish between patterns for spongy metal due to piping or finely distributed gas cavities and diffused sand or slag. Similar patterns may be seen when inspecting welds; the indications for an unfused region along a scarf face, slag streamers and cracks may appear alike.



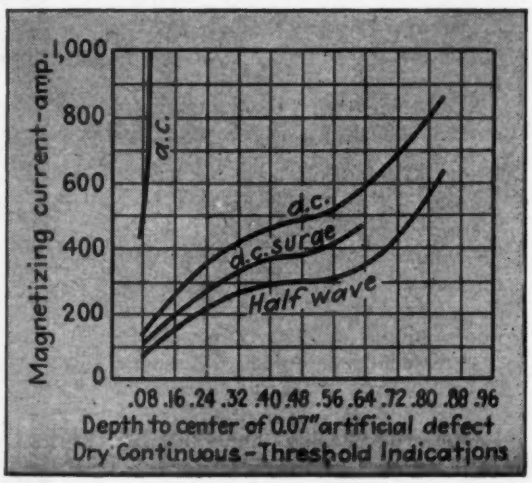
A leakage field at the crack causes a build-up of magnetic powder, thus creating an "indication." Dry magnetic particles are used conveniently for such tests

As matters now stand, the powder pattern visible in the indication tells the inspector with reasonable reliability that the defect is on the surface or below it, and possibly something about its extent. However, if a subsurface defect is involved, the pattern will not tell the inspector how far it is below the surface and how deep it extends.

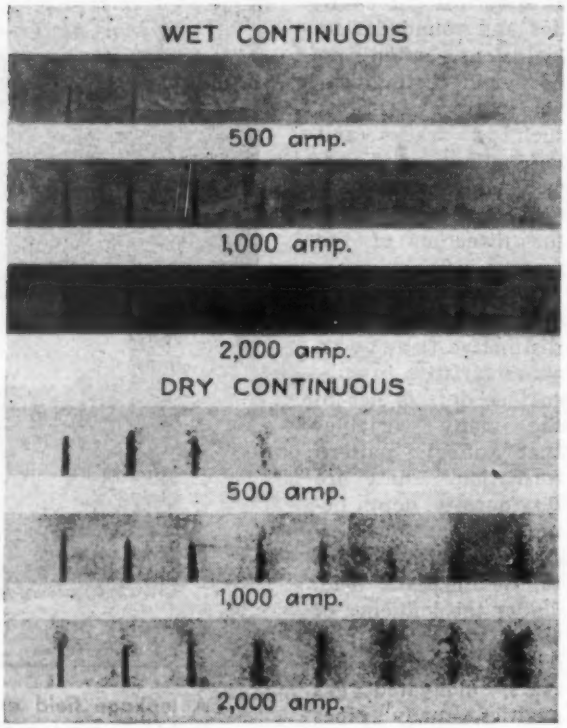


Left—Less current is needed to locate deep-seated defects when dry powder and d.c. magnetization are used

Below—Effectiveness of a.c., straight d.c., d.c. with surge and half-wave rectified a.c. are compared for location of deep defects, using dry powder. Currents indicated are meter readings



Four procedures are about on par with respect to picking up a forging lap in an aircraft rocker arm. In all cases, the wet method was used



Dry continuous procedure gives greater sensitivity and more easily identified indications, when discontinuities lie at increasing depth below surface

Therefore magnetic-particle testing is an excellent non-destructive test if its present limitations are kept in mind. On some kinds of work radiographic inspection may be required as a supplementary test, either to give reasonable certainty that technique for castings will avoid certain types of internal defects, or as a spot or 100 percent inspection of more critical pieces. From experience with steel castings used in critical locations, the Bureau of Ships has drawn these conclusions:

1. Correct interpretation of internal defects, such as gas porosity, sand and slag inclusion, and shrinkage, in most cases, is difficult or impossible with magnetic-particle inspection, whereas radiography will indicate internal defects that constitute a service liability.

2. On the other hand, magnetic-particle testing is considerably faster, it will discover fine cracks missed by radiographic inspection, it is mandatory for seeking cracks in sections too heavy for inspection by the other method, and its use prior to radiographing will save manhours in the over-all inspection and repair operation. These points in favor of magnetic-particle testing are added to its value for surface defects.

As stated previously, a magnetic-particle test requires two steps: (1) applying a magnetic field of the proper direction and amount to the workpiece, and (2) application of suitable magnetic particles in order to locate leakage fields caused by discontinuities in the metal. Various types of inspection may be handled by considering a number of variables: (1) magnetization, (2) sequence of operations, (3) characteristics of magnetic powder and (4) equipment. In regard to formation of a powder pattern, these matters must be appraised:

1. Flux density in the region of defect.
2. Orientation of defect relative to magnetic field.
3. Depth of defect below the surface.
4. Dimensions of defect.
5. Residual magnetism of the metal tested.
6. Characteristics of the powder.
7. Surface roughness of part.
8. Geometry of piece.

Two types of magnetization are available: *longitudinal*, in which the lines of flux are usually parallel to the work axis and in which the field is completed externally to the piece, and *circular*, in which the flux is usually at right angles to the workpiece axis and in which the entire field path is essentially contained in the piece. It may be necessary to use both forms of magnetization (as separate tests only) to search out all possible locations of leakage fields in the part. However, the two forms of magnetization cannot be applied

Magnetizing a crankshaft in a Magnaflux machine. Magnaflux inspection is completed by allowing fine magnetic particles to adhere to the crankshaft, permitting the detection of defects. Magnetic particles are held suspended in liquid, and applied by the operator with a hose while the crankshaft remains in the test fixture

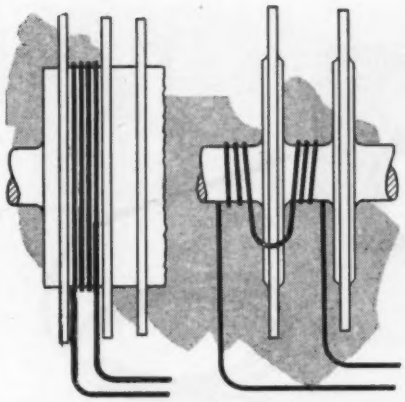
simultaneously. After the piece is magnetized by one method and inspected with powder for indications, it must be demagnetized thoroughly before the second form of magnetization is applied. On the whole, circular magnetization is preferred where one test will suffice, because better indications and fewer irrevelant powder patterns are secured. These advantages arise because the field is largely contained in the piece, and external fields are minimized.

The means for achieving these forms of magnetization are: for longitudinal—by inserting the component in a coil; wrapping a cable around the piece, or applying magnetic yokes: for circular—by passing current directly through the part for all-over magnetization, by means of prods for localized magnetization, or by means of a conductor placed within a hollow object. In circular magnetization, good contact is essential to avoid burning the piece or causing hard spots.

Sensitivity and the character of test results are affected by the choice of continuous or residual magnetization. The continuous method is the more sensitive because the magnetic particles are applied while current is flowing in the object and hence flux density is greater. However, the residual method is often more convenient, especially when inspecting small parts that are conveniently handled in batches. In the residual method, pieces are magnetized, then transferred to inspection later.

Distribution of flux in the magnetized article is affected by the power supply and the geometry of the piece. In general, d.c. produces deeply penetrating fields, and hence is the obvious choice when searching for defects below the surface. Under favorable conditions these may be detected as much as ½ in. below the surface. It is also the best form of power to use when inspecting the sides of a deep offset from the part axis as a side of a turbine wheel. On the other hand, if the discontinuities are at the surface, the use of a.c. power is advisable, because through skin effect the flux tends to follow the surface of the piece. However, it should be understood that either type of power supply is suitable when testing for surface defects; there is little difference in results if comparison is made on the actual effective magnetization realized with the current values applied.

Transformers are customarily used to supply low-voltage, high-amperage power for a.c. magnetization.



Method of wiring where ratio of shaft dia. to length of blades is greater than 3 to 1

Method of wiring where ratio of shaft dia. to length of blades is less than 3 to 1

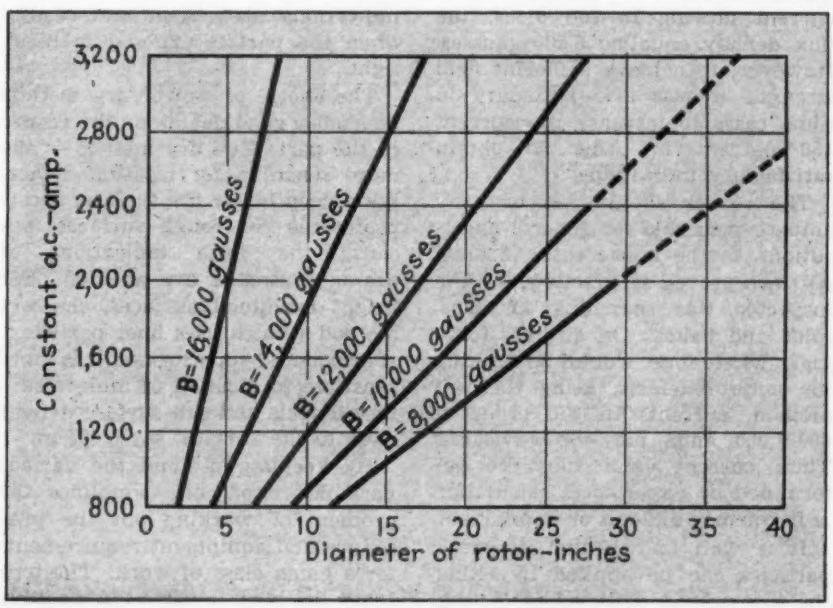
Shape of the workpiece affects flux density in the section under examination. Two methods are shown for creating magnetic fields in turbine blades installed in a spindle

For d.c. magnetization, welding sets, batteries and rectifiers are used. A variation in the d.c. method of magnetization is to allow the current to surge to a higher value than normal for the test and then drop back to a lower value. Stronger internal fields are so induced.

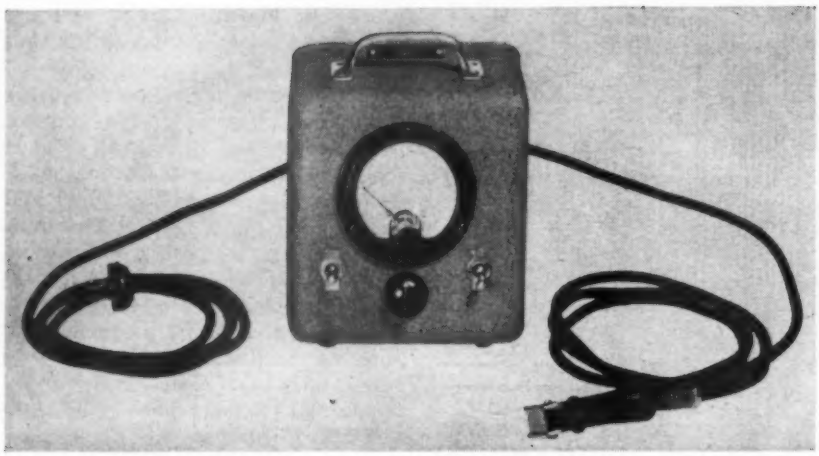
Electromagnets and permanent magnets may be employed when an occasional inspection is made of large machines, especially when one is looking for the existence of small cracks in localized areas, and use of cumbersome equipment is not desirable.

Flux density, or field strength, is a function of the current applied, permeability of the material, whether continuous or residual magnetization is used, and diameter and shape of the piece. Enough flux must be generated to create an indication: too much is bad because the magnetic particles will pile up excessively and obscure the pattern. Until recently it has been necessary to rely mostly upon experience with indications to know whether the right amount of current was being used. But the General Electric Company has developed a magnetic field gage which enables the inspector to produce the desired field strength at critical areas of the tested object. The gage is not calibrated in standard magnetic units: instead, it is calibrated against the field strength of 10-in. ring, magnetized with a definite number of ampere turns. In use, the gage is put on the demagnetized piece, set to zero with a rheostat, then the part is magnetized, and finally the current flowing in the piece is adjusted until the gage reads the desired number of arbitary field units.

Lacking such an instrument it is possible to arrive at a reasonable current value when inspecting large forgings, especially those containing deep offsets. A turbine wheel forging is an example. Here d.c. power is used when looking for forging



Given the diameter of the alloy steel forging and the degree of magnetization needed for satisfactory powder indications, it is possible to calculate the amount of constant d.c. to apply. These data were established for inspecting the sides of turbine wheels



A magnetic gage developed by the General Electric Company gives a direct indication of field strength, allows magnetic-particle testing of large castings and forgings under standardized conditions, thus avoids the need for calculating current required

folds, laps and thermal cracks in the side of the wheel. If the piece were a straight shaft, either a.c. or d.c. power would be equal on an ampere basis, but with the turbine wheel approximately 50 percent more a.c. would be required because the flux tends to concentrate at the rim and not the side of the wheel.

Permeability tests of steels have some value when establishing the amount of current to be applied for a specific inspection. When testing large forgings, that is, turbine wheels integral with a shaft, such permeability data enabled the inspectors to establish that at least 75 amp. were required for each inch of forging diameter. With this amount of current flowing in the piece, the flux density equalled 8,500 gausses. However, to achieve sufficient field strength it was also necessary in some cases to increase the current 150 percent in order to obtain satisfactory indications.

The reader should not use any ampere-inch rule for general application. In the above case, 75 amp. per inch proved satisfactory, but the inspector was searching for laps, folds and flakes. On aircraft forgings, where one would be looking for minute defects, using the wet method, currents in the order of 800-1,000 amp. may be advisable. Thus, current value must be determined by experience; calculation is frequently difficult or impractical.

It is well known that magnetic particles can be applied by either the dry or wet methods of testing. The dry method is particularly good for inspecting large objects like castings, locomotive railroad axles, locomotive cylinder heads, but of course can be used with pieces of any size. The magnetic particles may be colored red, gray or black for contrast with the work surface. The wet process is used, when it is more convenient and faster to employ a liquid inspection method such as flowing on the medium or dipping single pieces or batches of parts into a tank containing a paste suspended in kerosene or light oil. The paste may be either red or black. Or the setup may require flowing a suspension of magnetic particles over a piece, as, for example, to inspect gun barrels while rotating them between centers. Fluorescent particles have been developed for use with the wet method, so that location of the indications can be seen more readily when the part is exposed to black light.

The choice of wet or dry method depends a good deal upon the nature of the part. The dry method is the more sensitive for locating defects lying deep below the surface, and is preferable for rough surfaces, because the false indications of drainage streaks are avoided. For bright machined surfaces, the wet method (which uses finer particles) is considered superior and it is more sensitive to location of minute surface defects and sub-surface defects close to the surface, say 0.005 in.

By keeping in mind the various variables cited, one simplifies the problem of working out the procedure and equipment requirements for a given class of work. The tendency has been to use a too sensitive method. For example, in the aircraft field, inspection routine must be established to catch the smallest crack or other defect which might cause failure of a highly stressed part. So it has long been the practice to use the d.c. continuous procedure at high current values. This test will reveal all fine surface discontinuities, plus indications of non-metallic inclusions, or stringers, below the surface. The latter are rarely cause for rejection but a great number of serviceable parts have been thrown out by unskilled personnel because they could not properly evaluate the various indications. Lately, the substitution of the wet-residual method, which is less sensitive to sub-surface non-metallics, has come into use. The problem of interpreting indications has been simplified, because indications of unimportant conditions are automatically reduced.

The seeing task involved in finding small cracks at the roots of threads and in recesses has been simplified by the wet fluorescent method.

In the overhaul and maintenance fields, primary fatigue cracks are of special interest. Hence a.c. magnetization is extensively employed.

In the inspection of heavy forgings or castings, welding sets are often used to apply d.c. power. Longitudinal magnetization is secured by wrapping the cable around the piece, or by means of prods; circular magnetization by threading cable through an opening. Portable equipment is also employed, using rectified a.c. for prod magnetization. When all-over magnetization is required, heavy-duty rectifier units of 5,500 amp. output, or more, are found suitable. For these inspections, the dry-powder, continuous method of testing is common.

The location of deep-seated defects in welds is often a baffling problem. A harmless undercut at the surface of a weld, or certain features of the joint, may give an indication. Does the indication hide a crack? In some cases, an experienced operator will not be misled, because the pattern should be more strongly marked if a crack exists. In others, it is still impossible to say whether the joint is unsound because of indications obtained by magnetic-particle testing. Where the joint design will not interfere with application of the method, d.c. magnetization should be used. Most satisfactory results have been obtained with prod magnetization, using d.c. with surge or half-rectified current and dry powder. Lately, some weld inspection has been done with portable equipment that will deliver d.c. or a.c. power, at the operator's option.

Production Trouble-Shooting

PROVES EFFECTIVE ON B-29 BOMBERS

BY CLYDE L. BELDEN, METHODS SUPERINTENDENT
WICHITA DIVISION, BOEING AIRPLANE COMPANY

A staff of methods engineers assists Boeing supervisors in smoothing out manufacturing problems on the large bombers

A SMALL GROUP of methods engineers, each of whom is a production specialist, can be credited with having helped to iron out many of the production problems which have come to light in setting-up the Wichita Division of the Boeing Airplane Company for mass production of the B-29 "Superfortress" bomber. These methods engineers have had considerable experience in the manufacture of various types of airplanes and each was selected for this work because of proven ability to get things done. One of them is located in each production department. Each methods engineer is assisted by a small staff of junior engineers.

Each methods engineer is a staff employee without direct supervisory authority. It is his responsibility to assist the production supervisors in his department with manufacturing problems they encounter in their daily work. This is done in two ways. A standard "complaint" form is provided so the supervisors can report to the methods engineer any manufacturing difficulties which come to their attention. These complaints are followed up by the methods engineer until a satisfactory answer has been obtained. He consults with the engineering department, the production department, the tooling department and other staff groups, and prepares a report on a special form, outlining what action will be taken to clear up the difficulty. This report form has spaces for noting "follow-up" dates which are used if a future check is to be made to insure that some promised action is taken. A file clerk in the office of the methods engineer keeps these reports in a file until each case is closed.

The second function of the methods engineer is to suggest to the production supervisor, product engineers and tool engineers improvements in methods, tools or product

A standard "complaint form" is used by production supervisors to bring manufacturing problems to the attention of the methods engineers. A careful follow-up system insures that prompt action is taken on each such complaint

COMPLAINT FORM Nº 755

Date 9-8-44 Shop 201

Part No. 15-15753-42M

Description TEE ANGLE RING

DIFFICULTIES: (In Detail—If necessary, accompany by memo)

APPROXIMATELY 50% OF THESE PARTS ARE MISFORMED. DO NOT HAVE ENOUGH CONTOUR AT BOTH ENDS.

Signature John C. Adams
SUPT. OR GEN. FOREMAN

DISPOSITION
(FOR USE OF METHODS DEPT. ONLY)

Longer length material will be purchased for production use. Effective by 11-15-44.

Dept. 95, by A. Noff

Dep't SUBASSEMBLY Shop 201 Foreman Yeager Date 9-11-44

Name, 95 Representative HOFF

Gen. Observations by Dep't. 95 COMPLAINT FORM NO. 755

Irregularities noticed 15-15753-42M TEE RING NOT FORMED TO FULL LENGTH OF RING. MADE ON BUFFALO ROLL.

Recommendations made NEEDS MORE MATERIAL AT END.

Action taken COMPLAINT FORM WAS COORDINATED WITH TOOLING AND PURCHASING. LONGER MATERIAL ORDERED. Form No.

To be followed up (1) 8-21-44 (2) 9-15-44 (3) 9-30-44

Each job handled by a methods engineer is reported on the form shown. In case further action is needed, he indicates on the bottom of the form the next date when a follow-up check should be made. A clerk in his office returns this report to him on the follow-up date so further action can be taken

designs which will aid in simplifying production operations, improving production rates or make it easier to manufacture the various parts to the tolerances required. These recommendations can be put into effect only after agreement has been secured from the interested parties. The methods engineers are not required to force an issue, but rather to lend a hand to ease the duties of the production supervisors.

It no longer is necessary for a production supervisor, for example, to spend time conferring with the tool engineers when a tool revision is needed to facilitate a production operation, or with the product design engineer when a change in the design of a component part will make it possible to make the part quicker or better, or to assemble the part with other components without hand fitting. Such projects are followed up by the methods engineer, who reports promptly to the production supervisor. If the proposed changes can be approved; the methods engineer follows up to make sure they are made at an early date; if they cannot be approved for some reason, he lets the supervisor know *why*.

Another important function of the methods engineer is the maintenance of correct manufacturing procedures in his department. Often, he will be called on to assist in training production employees to use new or improved tools and methods. Then he observes their work on the floor to insure that they perform their tasks in the proper way. Thus full advantage is taken of improved procedures.

The methods engineers assigned to the fabrication shops assist in determining the value of various tooling set-ups, and record on standard data cards the machines, speeds, feeds, and other items to be used when performing a given operation with the tools selected as best for the job. One set of these cards is kept in the desk of the production supervisor of the department, another set is retained by the methods engineer for future reference. These methods engineers also run tests on different types of tools to determine their operating economy so that the best tools possible can be recommended for each set-up.

Methods engineers assigned to subassembly and assembly departments are on the alert for better ways of putting the parts together. The use of squeeze riveters in place of pneumatic riveting hammers is, for example, being fostered because their use results in more uniform riveting. Often, special riveting tools will be suggested where difficulty is being experienced with proper forming of rivet heads. With the multi-line production system used for the manufacture of the B-29 bomber on a mass-production basis, the methods engineer has many opportunities to help speed production operations by making sure that assembly operations are properly divided between the different stations along each line. Often the shifting of one or two operations between assembly stations will reduce work interferences and make for better working conditions at each of the stations. The result, of course, will be an improvement in the production rate for the line.

Work centers and danger areas on most machine tools installed in the Boeing-Wichita plant are painted with a light-colored contrasting paint. Areas to be painted were selected by methods engineers to insure uniformity

Once definite manufacturing procedures have been set for operations in the machine shop, data for each machine set-up are recorded on this form by the methods engineer for future reference by the shop supervisors

PART NO.	15-7242-5	MACHINE SET-UP CHART	DATE 8-18-44
NO. 1	OPERATION . . Rough Mill Base - use Cincinnati Hydromatic CUTTER . . . . 6 in. Carbide Hyper-Face Mill - 8 teeth SPINDLE r.p.m. . . . . 320 FEED i.p.m. . . . . 15 PRODUCTION AVERAGE . . . 12 per hr. ALL PARTS TO BE BURRED		
NO. 2	OPERATION . Straddle Mill Boss - use Cincinnati Hydromatic CUTTER . . 2 Carbide Half-Side Mills - 8 teeth - Neg. rake SPINDLE r.p.m. . . . . 320 FEED i.p.m. . . . . 15 PRODUCTION AVERAGE . . . 14 per hr. ALL PARTS TO BE BURRED		
NO. 3	OPERATION . . Bore Hole 1/16 in. Undersize - Bormatic CUTTER . . . . Carbide-Tipped Bar SPINDLE r.p.m. . . . . 500 FEED i.p.m. . . . . Med. Feed PRODUCTION AVERAGE . . 12 per hr. ALL PARTS TO BE BURRED		

Fixtures Improve Output Of Polishing and Buffing Machines

By A. H. LOSEY, HAMMOND MACHINERY BUILDERS, INC.

Machine tables accommodate six to eight fixtures. Examples of holding set-ups for production of various parts are presented

WARTIME REQUIREMENTS have led to wider use of automatic polishing and buffing machines to permit higher production, with greater precision than afforded by standard hand methods. The automatic machines are built in various combinations of relatively standard units, and their extreme flexibility in adjustment of heads, selection of table speeds and design of work-holding chucks, makes them adaptable to a wide variety of parts to be deburred, brushed, polished or buffed. The key to efficient automatic finishing is the correct combination of wheels, wheel speeds, work rotating speeds and the length of time (dwell) the wheel is in contact with the work. All of these are variable in automatics and can be selected easily to suit any particular type of work.

In Fig. 1 is shown a typical set-up for deburring and finishing both ends of aircraft engine studs at the rate of about 450 finished parts per hour. The automatic polishing unit has a 21-in. outside diameter variable-indexing table equipped with eight revolving automatic contracting work-holding chucks designed to fit this particular part. The parts are turned end for end in the fixtures by hand to process both ends. Table indexing is at the rate of 900 indexes per hour.

After being loaded into the chuck, the work first is indexed to the wheel at the left, which is a 12-in. diameter, 0.005-in. steel wire brush mounted on a 1¼-in. spindle running at 2,600 r.p.m. This wheel removes the burr from the starting thread left on the stud by the threading operation. The second and third wheels are 12-in. diameter treated tampico wheels,

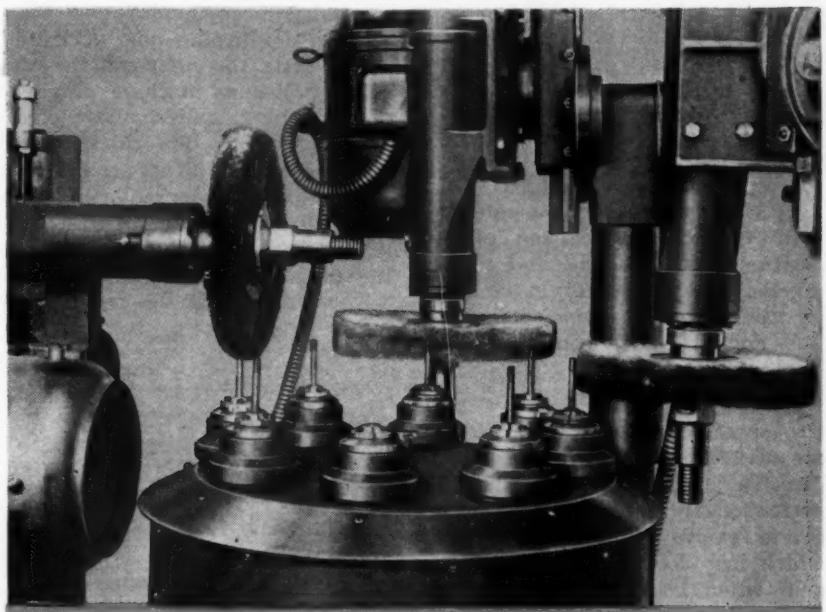


Fig. 1—An eight-spindle indexing table is used on this automatic polishing machine for deburring and finishing aircraft engine studs. A steel wire brush and two treated tampico wheels are employed

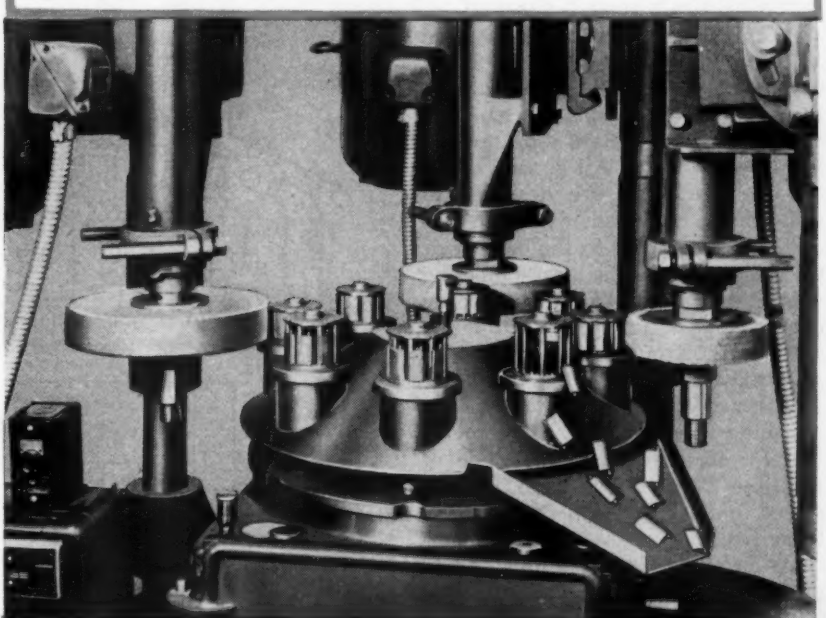


Fig. 2—Special eight-position chucks are used at each of the eight-spindle positions on this automatic polishing machine. Output of this machine is from 1,500 to 2,000 turbine fins per hour

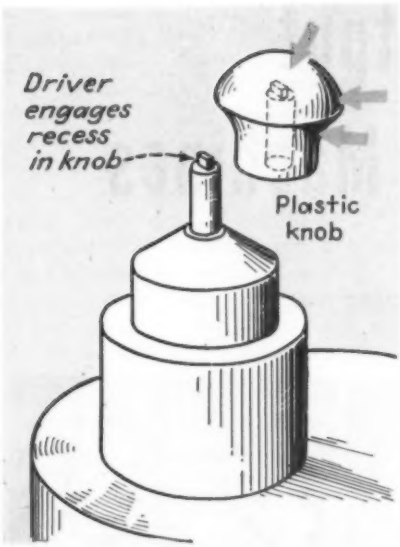


Fig. 3—A simple vertical spindle fixture is used for polishing plastic knobs. A driver on the end of the spindle engages a recess in the bore of the knob. Arrows indicate direction of wheel application

also operated at 2,600 r.p.m., which are used for brushing the entire threaded area to remove the fine imperfections present after threading and to remove all the so-called burrs which may loosen and fall off the stud when it is assembled into a motor. Composition is applied automatically to all three wheels at each index of the table. The compound is applied exactly the same each time, thus wheel cuts remain constant.

Of the same general design as the polishing unit shown in Fig. 1, the turbine-fin finishing unit shown in Fig. 2 has eight special multiple chucks designed to hold eight turbine fins in each chuck. All of the chucks are identical, and are designed to draw down by means of a cam and spring arrangement in the base prior to indexing into the first polishing wheel. At the end of the polishing cycle, the parts are ejected automatically into a trough. The operator is required only to load the chucks as they reach the loading station. The polishing wheels are 10-in. diameter and 1¾ in. wide, and are made of multiple sections of ⅜-in. spiral-sewed buffs glued together. All of these wheels are set up with two coats of No. 180 aluminum oxide grain. Standard stick tallow is applied to all wheels when new and the last wheel is kept greased regularly, insuring a smooth, fine greased surface on the parts being finished. Because of the multiple chucking arrangement, it is possible to produce from 1,500 to 2,000 parts per hour on this machine.

Usually tables on automatic polishing machines vary in diameter to accommodate six or eight work-holding fixtures, depending upon the type of machine and upon the type and diameter of the work to be processed. Work-holding fixtures can be varied to suit a wide variety of parts. Many parts require only simple work-holding and driving fixtures while others, like those used for piston polishing operations, are somewhat more complicated. Fig. 3 shows a simple plug-type work holder for a six- or eight-spindle automatic polishing machine employed for polishing and buffing plastic knobs at production rates ranging from 700 to 1,000 pieces per hr. Three wheels are used for polishing these knobs. It will be noted that the work is loaded merely by placing it onto the plug extending vertically from the worktable spindle, and that the

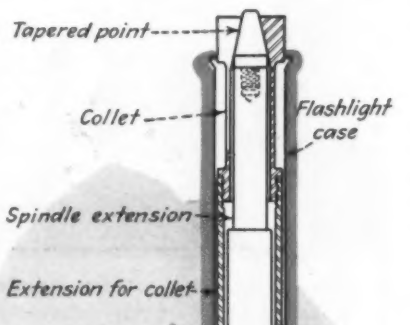


Fig. 5—This expanding-type fixture has a three-jaw collet for holding cylindrical flashlight cases for automatic polishing. The clamping mechanism is actuated from a cam at the side of the machine

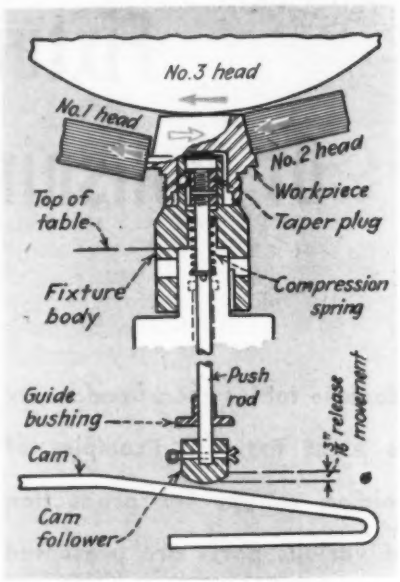


Fig. 4—Three ¼-in. diameter steel balls are held by spring pressure against the bore of a fuse body in this set-up. The three polishing wheels are mounted on separate spindles around the indexing table of the automatic polishing machine

work rotates by engagement of a driver in a recess in the knob. Automatic polishing of plastic escutcheons can be done on similar machines having simple collet-type expanding work-holding fixtures mounted on the table spindles. These fixtures are cam-operated from beneath the table so that the work is held fast while at the work staions, and is released for easy removal and replacement when at the loading station of the machine.

The expanding work-holder shown in Fig. 4 has three steel balls expanded by a tapered plug. It is shown adapted for polishing the top, sides and shoulder of a bomb fuse body at a production rate of 500 to 600 pieces per hr. Each of the three polishing wheels is set up with No. 180 grain abrasive. The tapered plug is held down by means of a compression spring except when the cam follower is raised by contact with the cam when the fixture is in the loading position. The work is positioned vertically by contact with a step on the fixture body.

A special expanding fixture for holding three-cell flashlight cases for automatic polishing on a multiple-station machine is shown in Fig. 5. Depending upon the machine selected, six or eight of these spindles may be located around the indexing table. In this fixture there is a spindle extension mounted on the top

of each standard vertical spindle on the machine table. At the top end of this spindle extension is a tapered point which serves to expand the work-holding collet carried at the top of the extension when the sleeve is moved vertically downward by action of the compression spring. At the loading position on the machine a cam moves the operating lever so as to shift the collet vertically and release the work. When the work is released, the operator lifts the work-piece off the fixture and drops another in place. Then, when the table again is indexed, the roller-type follower on the operating lever loses contact with the cam and the compression spring moves the collet downward so that it is opened by contact with the tapered point on the spindle extension.

Similar in principle to the fixture shown in Fig. 3, a plug-type fixture, Fig. 6, was developed for polishing and buffing wrench sockets. Depending upon the number of spindles on the indexing table, and the operations to be performed, from 500 to 1,000 pieces can be polished and buffed per hr. on such fixtures. These fixtures have interchangeable drive plugs and adapter sleeves so that a wide variety of sizes and lengths of wrench sockets can be finished on the same machine. In this fixture a cylindrical body is keyed to the top of the vertical machine table spindle, and is arranged to hold and drive the hardened and ground tool steel drive plug which is machined at the top end to fit the interior of the wrench socket. A hardened adapter sleeve is mounted over the drive plug to properly position the socket for height while it is being polished and buffed. Usually, two polishing wheels and two buffing wheels are used for finishing these wrench sockets.

Expanding chucks having removable jaws frequently are used for holding small gears, castellated nuts and similar items for wire brushing or polishing operations. Such a chuck is shown in Fig. 7. Like the fixture shown in Fig. 4, this chuck is cam-actuated by means of a push rod extending vertically downward through the table spindle. A compression spring keeps the collet of the chuck expanded against the work, except when the tapered plug inside the collet is raised through contact of the follower on the push rod with the cam at the loading station of the machine. A wide variety of work-holding jaws can be mounted on this chuck. In some set-ups, castellated nuts are being deburred with wire brushes at the rate of 300 to 500 pieces per hr. In other set-ups using similar chucks, small steel pinion gears are brushed to remove burrs and finish the edges on the outside diameter at the rate of 150 to 200 pieces per hr. with the work being reversed on the chuck so as to finish both sides.

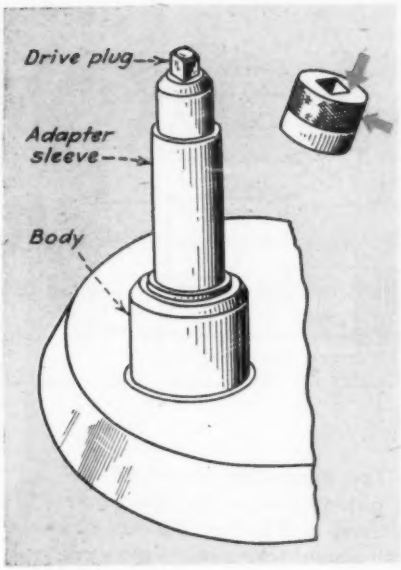


Fig. 6—Interchangeable drive plugs and adapter sleeves on this fixture make it possible to polish and buff a range of sizes of wrench sockets at the rate of 500 to 1,000 pieces per hour by two wheels, shown by arrows

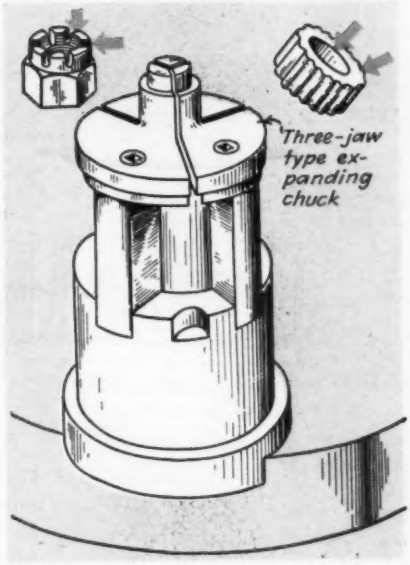


Fig. 7—Castellated nuts, small pinion gears and similar parts can be held for deburring, or polishing and buffing, on this three-jaw expanding chuck fixture. The arrows denote polishing wheels

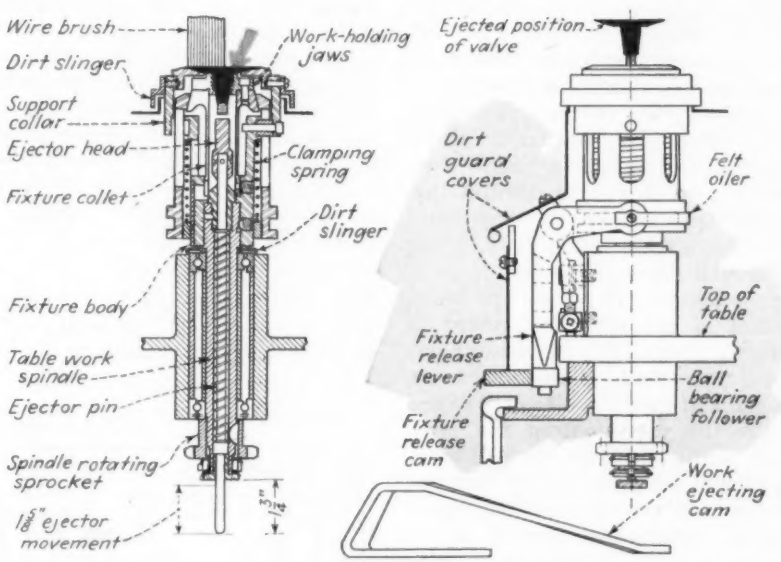


Fig. 8—A double-acting fixture was developed for cleaning and roughing up the end of a rubber-bodied valve stem preparatory to cementing this surface to the body of a tire inner tube. Cams are used at the side of the machine and beneath the work table to operate the clamping and ejecting mechanisms

Socket-type work holders are used for a variety of polishing and deburring operations. The holder has a driver for locating and driving small internal gears on which the gear teeth are deburred and rounded on the ends at the rate of 500 to 800 pieces per hr. A six-spindle indexing work table is used for this operation. Tampico brush wheels provide a satisfactory finish on gears of this type. Each socket is designed for mounting directly on the top end of a vertical spindle on the indexing table.

The fixture shown in Fig. 8 is de-

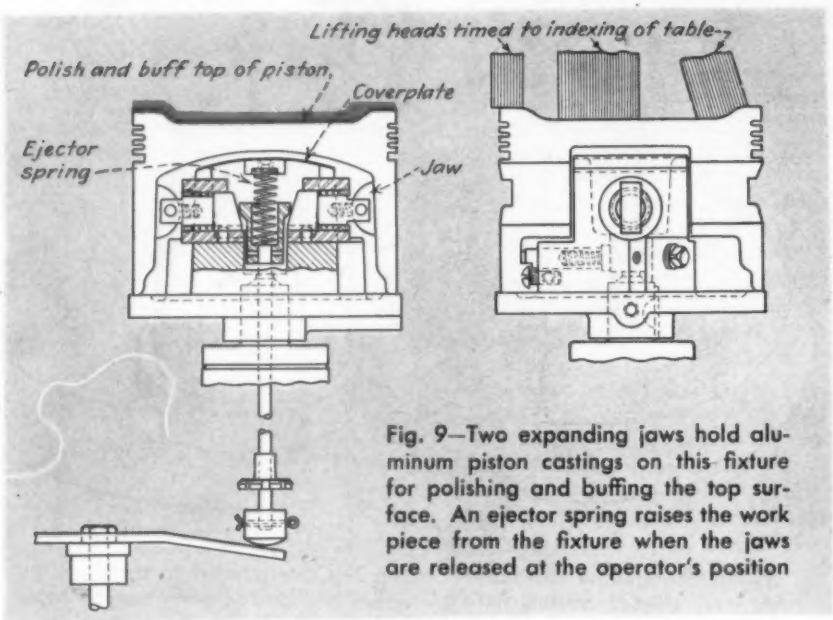


Fig. 9—Two expanding jaws hold aluminum piston castings on this fixture for polishing and buffing the top surface. An ejector spring raises the work piece from the fixture when the jaws are released at the operator's position

signed for automatic clamping, releasing and ejecting rubber valve stems for inner tubes which are roughed up by wire brushing at the rate of 1,000 to 1,200 pieces per hr. on an automatic machine. This wire brushing operation is used for cleaning and roughing up the end surface of the valve in order that it can be cemented to the rubber tube. Two cams are employed to operate this fixture. One is used to open and close the work-holding jaws, while the second operates the work-ejecting mechanism. The cams are timed so that as the table is indexed to bring the fixture into the loading position, the work-holding jaws are opened and then the ejector is raised to lift the valve out of the jaws. Then, while the jaws are still open, the ejector pin passes off the ejecting cam so that the operator can insert another valve body. Finally, as the fixture is indexed from the loading station to the first work station, the fixture release lever leaves the release cam, thus closing the work-holding jaws.

In Fig. 9 is shown a plug type fixture with expanding jaws for holding aircraft engine pistons for polishing and buffing the head surfaces. The cam at the unloading position on the machine raises a lift rod which releases two jaws and also compresses a vertical ejector spring, which, in turn, raises the piston body from the fixture so that it easily can be removed. With recessed-head pistons, as shown in the sketch, it is necessary that lifting-type polishing heads be used, with the lifting mechanism timed with the indexing of the table so that the wheels lift out of the work before the table indexes. Dome-type pistons do not require this feature on the polishing machine. Usually, six-spindle indexing tables are used for polishing and buffing pistons and four-wheel heads are employed. In some set-ups, the first two wheels perform the polishing operation and the second two buff the polished surfaces. With this condition, production usually is about 300 to 400 pistons per hr. In some instances it is necessary to use four set-up polishing wheels. Where this must be done, the four wheels on the machine are used to polish a quantity of pistons, and then they are replaced with proper buffing wheels so that the pistons can be run through the machine a second time for the buffing operation. The buffing operation usually requires ventilated-type buffs as it is advisable to keep the piston surfaces cool.

Fig. 10 shows an example of special tooling for automatic polishing and buffing operations which indicates the extent which it is possible to go in setting up these machines for high-production operations. This fixture is used for buffing fountain pen barrels at the rate of 800 to 1,000 pieces per hr., and removable work-holding points are provided for various types and sizes of work. At the loading station, a head-lifting cam releases the clamping head so that the operator has only to work against the tension of a light work retaining spring. This insures against the finished barrels falling out of the fixture and being damaged by striking a machine surface. The polishing and buffing wheels used on this machine are set on vertical spindles and are shaped on their periphery to cover the entire surface of the barrel being finished. This fixture also is designed with adjustments for the head so that various lengths of work can be accommodated in different set-ups.

Overhead clamp for the fountain pen barrel polishing fixture carries a ball-bearing clamp spindle so that the clamp points which contact the pen barrels rotate easily from pressure transmitted from the driven spindle on the indexing table.

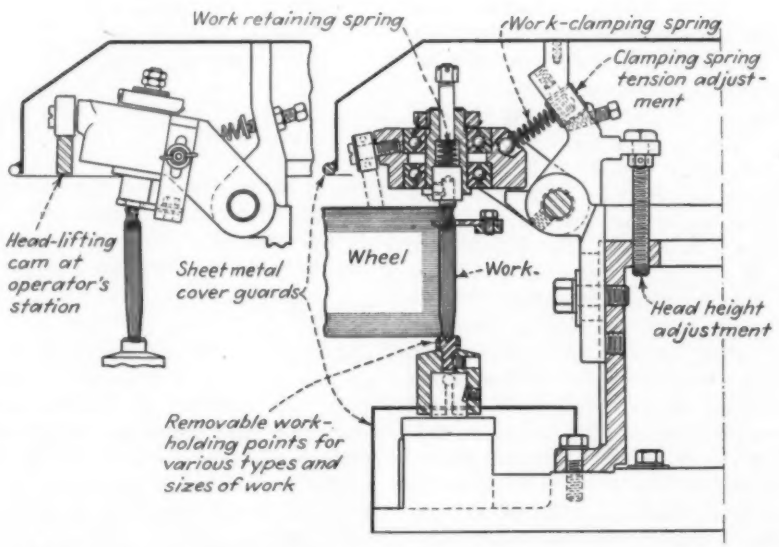


Fig. 10—Overhead actuation of the clamping unit was necessary on this fixture in order to provide adequate support when polishing and buffing fountain pen barrels. When the clamping unit is raised a retainer holds the work piece until removed by the operator

Practical Ideas

★ **War-Winning Suggestions appearing here were recognized as meritorious by the Board for Individual Awards, War Production Drive, and the Navy Employees' Suggestion Program. They are offered to industry to aid in war production** ★

Radio Plugs Precision-Soldered On Semi-Automatic Machine

ANTHONY ZAPPIA, Leadman and Supervisor
Grumman Aircraft Engineering Corporation, Bethpage, Long Island

Certain types of extensively used aircraft-radio plugs are difficult to solder. To maintain schedules and obtain an acceptable article by hand, requires a skillful operator and much patience.

The trouble is due to the size of the cup into which the wire fits; it is so small that sufficient heat cannot be transferred from the soldering iron tip to melt the solder.

When an 18-conductor plug is to be soldered, the use of an iron proves clumsy; also, the special tip requires frequent cleaning.

An electrical method has been developed which consists of a step-down transformer of about 100-watt capacity, the secondary output being about 20 amp. To control the heat delivered to the soldering point, a 100-ohm, 100-watt variable rheostat is connected in series with the primary; by this means, the secondary amperage can be controlled.

The electrical soldering circuit consists of a heater pin connected to one side of the secondary circuit and a carbon tip to the other.

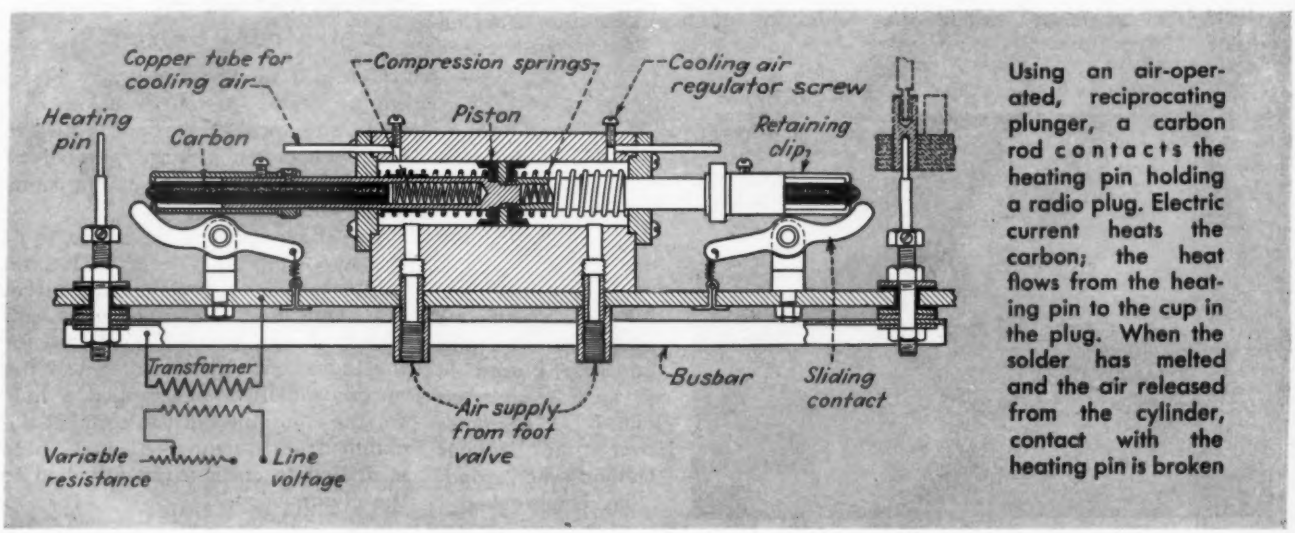
The heating pin is made to fit the cups snugly to obtain good heat conduction, and this pin is insulated from the frame of the machine.

The carbon electrode is moved by an air cylinder, in which slides a piston carrying a through piston rod. This piston rod is solid at the piston but otherwise it is hollow. In both tubular ends are helical springs held in compression by the carbon electrodes, and these electrodes are retained in position by clips fastened to the free ends of the piston rod. As the carbon point is consumed, the helical spring in the hollow piston rod feeds the carbon outward against the clip and maintains a constant point position. The carbon electrode slides over a fixed contact as it moves outwardly or inwardly; by this method, only a short section of the carbon is heated.

The piston is centralized, when not in use, by helical compression springs which are placed between the cylinder heads and the piston.

The cylinder is double-acting, air being admitted to one side at a time by a foot valve. In the cylinder heads are located holes into which short copper tubes are placed; their purpose is to direct a jet of air against the heating pin to cool the joint and set the solder; the amount of air discharged is regulated by adjusting screws in the cylinder block.

The method of operation is simple, because both hands are free. A plug is placed on the heating pin and the foot valve is depressed: air entering one end of the cylinder forces the piston and carbon electrode outward, the carbon tip makes contact with the heating pin, completing the circuit. Due to the high resistance of carbon, the passage of current creates heat, which is trans-



Using an air-operated, reciprocating plunger, a carbon rod contacts the heating pin holding a radio plug. Electric current heats the carbon; the heat flows from the heating pin to the cup in the plug. When the solder has melted and the air released from the cylinder, contact with the heating pin is broken

fered to the heating pin, and this heat flows to the cup to melt the solder. After the solder is fluid, air is released from the cylinder, then the piston springs retract the piston and open the electrical circuit. The same series of operations occurs for the other heating pin.

Because the machine is double ended, one plug is being soldered while the other is cooling. The result has been a better product accompanied by a pronounced saving of time. *War Winning Suggestion From the Board for Individual Awards, War Production Drive.*

Top and Side Chipbreakers Ground at Same Set-up

BY KENNETH THURSTON
Packard Motor Car Company

Grinding chipbreakers, 1/16 in. wide, 1/32 in. deep, at 1/32 in. radius, on the tip and side cutting edges of a tool, customarily means two set-ups of the toolholder in a vise.

By designing a plate with two pins on the surface, it is possible to grind one chipbreaker, then swing the tool around and grind the other, without changing the position of the vise or the plate.

The fixture consists of a plate clamped in the vise. The two pins are placed so that when the pivoted toolholder is against the front pin, the tip of the tool is parallel to the grinding surface: when the tool is swung about its pivot and against the side pin, the side chip breaker can be ground. Headless setscrews hold the toolbit in proper location in the toolholder.

With this improved method, the output is five times the plain vise set-up. *War Winning Suggestion from Board for Individual Awards, War Production Drive.*

Accurate Drilling Obtained by Grinding Chuck Jaws in Machine

BY LOUIS EICKHOFF
Ford Instrument Company, Inc.

For accurately spaced and sized holes, it is necessary to hold the drill centrally in the chuck. To obtain best results, the jaws should be surfaced while the chuck is mounted in the drill press or lathe.

A good method is to clamp a portable grinder to the table, then grind the jaws. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

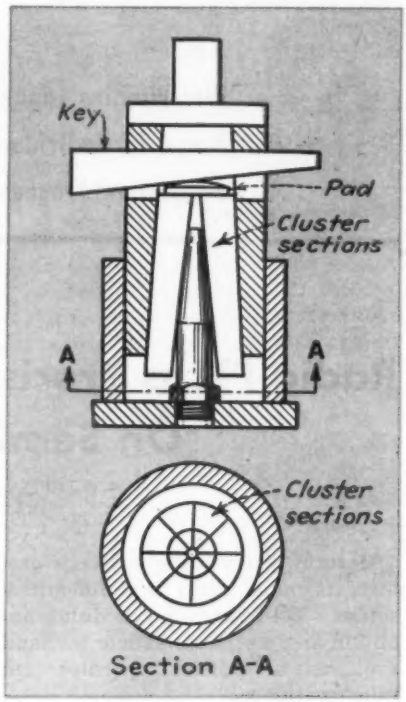
Deformed Welding Tips Reshaped By Simple Swaging Die

BY S. SHEFFIELD
Gulf Shipbuilding Corporation, Mobile, Ala.

In these days of short supplies, the reclamation of damaged gas-welding tips saves both time and money.

Swaging the tip can be accomplished readily by the use of an eight-section cluster die. The inside of the sections is shaped to the finished contour of the tip, while the outside is a straight taper corresponding to the inside of a cup which holds the segments in position. This assembly is contained in a pot which acts as a guide.

The worn tip is placed in the pot, the segmental die is placed over it, and the cup holds the eight sections together. When completely assembled, the tool is placed in an arbor or hydraulic press, which will exert enough pressure to squeeze the metal into shape.



This swaging fixture squeezes the worn tip into shape, and thus reclaiming becomes a quick and economical operation

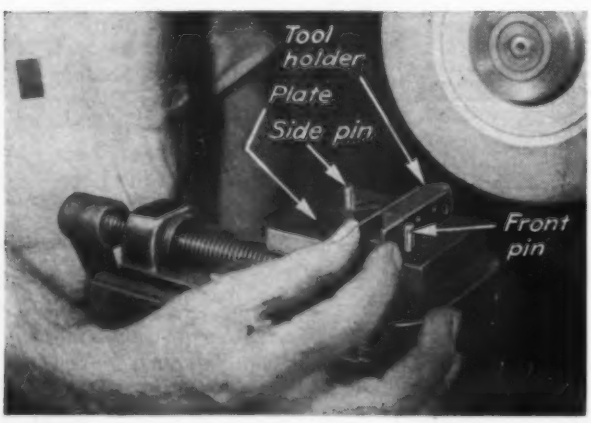
The die is removed from the cup by a drift like those used on taper-shank twist drills. After reshaping the tip the hole is machined to size. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Four-Station Lathe Carriage Stop With an Indexing Pin

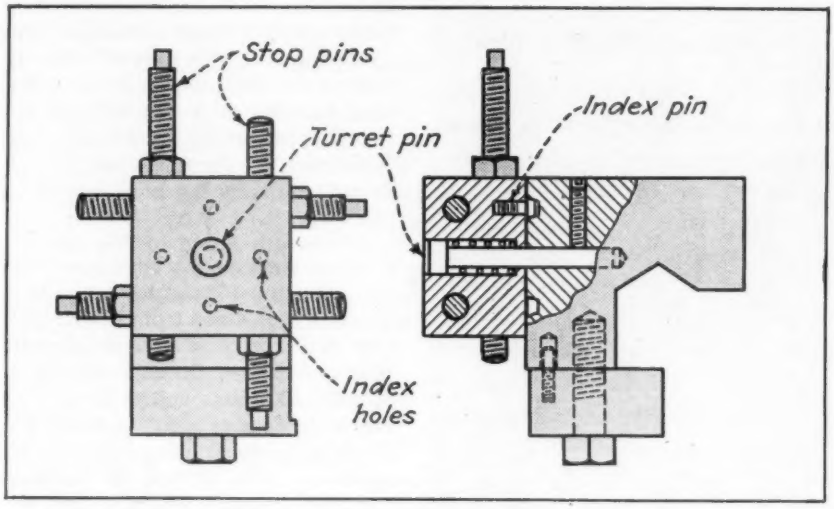
BY DONALD R. TRYER

Clamped on the front way of an engine lathe, a four-position carriage stop proves to be a valuable asset whenever a large number of pieces are to be turned to the same lineal dimensions.

The shear block is machined to fit the way snugly, a hole is located in its apron to receive the turret pin, and four tapered holes are bored, in the correct positions, for the index pin. In the bottom of the apron is drilled and tapped a hole for the clamping bolt; to prevent the clamp from turning, a small hole is drilled to enter a pin attached to the clamp.



An inexpensive plate, with two pins correctly placed in its surface, increases output five times over the former method when grinding chipbreakers



The carriage stop can be clamped at any convenient position along the lathe bed and four operations can be done in succession without having to stop to measure each one

The turret is a rectangular steel block with a counterbored hole to receive a compression spring and turret pin; after the spring and pin have been placed in position in the hole, the edge is peened over to hold the pin in position. On the contact surface of the block is located a tapered indexing pin which fits into any one of four holes in the shear block apron. The stop pin holes are drilled and tapped through the turret block, care being taken to offset pairs of holes in the same face to clear those going through from an adjacent side.

The threaded stop pins can be hardened to resist wear, and, if they are not close together, locknuts are provided to prevent the pins from moving.

The turret pin is entered into the hole in the clamp block apron, the spring is compressed by pushing on the head of the pin, then the setscrew is tightened to hold the turret pin in position. The spring cannot be compressed solid, because sufficient residual movement must remain to allow the turret to be pulled out and clear the index pin.

Operation is as follows: the bar stock is moved out of the chuck or collet to the desired length and a cut is taken. When the cut is to the necessary dimension, the stop is adjusted until it is solid against the carriage; the same process applies to the other positions.

To index the turret, grasp the stops and pull the block toward you, then turn to the next position—when the taper index pin drops into the hole, that stop is ready for use. To avoid confusion, each one of the turret positions should be numbered distinctly so that any position can be identified quickly.

Bevel Gear Backlash Determined By Micrometer Indicating Gages

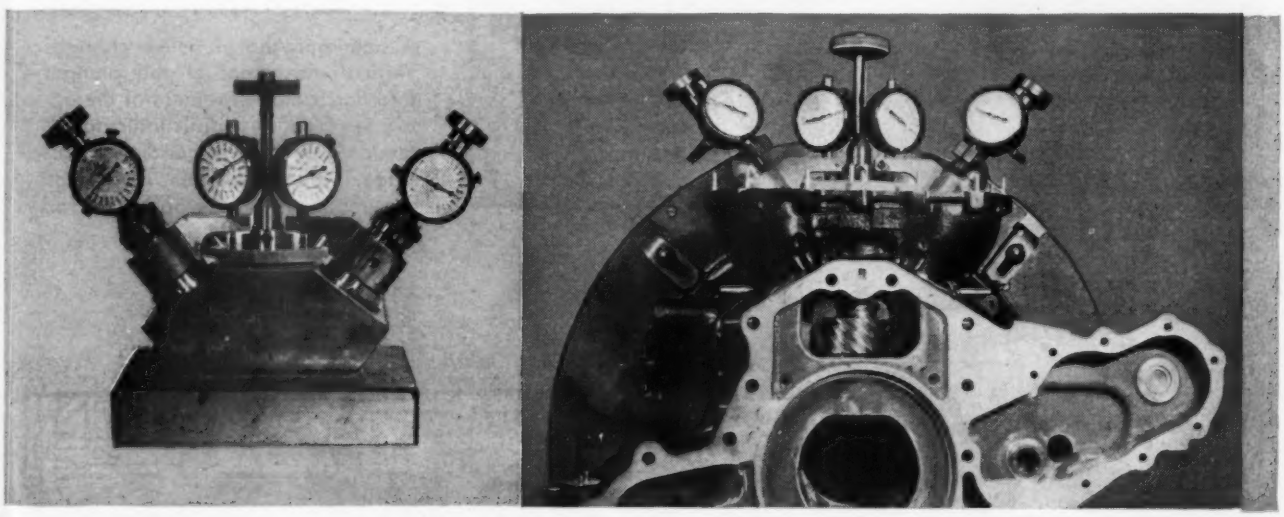
BY F. R. McFARLAND
Aircraft Engine Division
Packard Motor Car Company

Bevel gears are noisy and wear quickly when the backlash is too great, because the teeth do not contact properly. The cone height and angle can be determined accurately, but the backing will be out a few thousandths of an inch.

To hold the backlash within limits has been a cut and try operation, a case of fitting washers of various thicknesses until the clearance had been obtained. This required many trials before success was obtained.

A master was made for the correct distances to the backs of each bevel gear. A frame was used to carry indicating gages. When this frame is mounted on the master, each dial could be set.

After the wheel case has bevel



The bracket carrying the gages is mounted on the master and all dials set correctly. After the bevel gears are assembled in the wheel case, the dials indicate the thickness of washers required

gears assembled in it, the gages are mounted into position and the variations from the master read directly. From these readings, the thickness of spacers can be determined.

These gages have shown a saving of over more than 5,000 manhours a year over the cut and try method. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Special Star Gage for Bomb-Bay Door Screw

BY RALPH HEMBROUGH
Boeing Airplane Company, Wichita Division

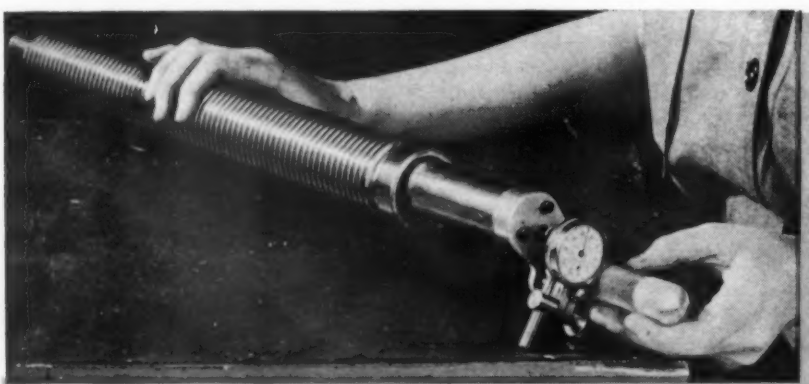
Bomb-bay doors of the B-29 Superfortress bomber are operated by electric motors which open and close the door through screw mechanisms. Each of the large screws used in these units must be made to close tolerances in order to insure operation under any conditions. For example, the bore of these long, hollow screws must be held to the specified diameter of 1.563 in. plus 0.004 in. minus 0.000 in. for the entire length of the bore, which is about 19½ in. deep. To check this bore, Boeing-Wichita inspectors have been provided with special indicator-type star gages of the type shown in the accompanying illustrations.

Have You a Practical Idea?

. . . If so, send it in. Your idea will help other men, in other shops, who have a problem similar to yours. Thus the plowback of experience will promote progress and prevent repetition of past errors. But be certain your idea is really practical—no day dreams or untried whimsies are wanted. We pay for contributions prepared exclusively for this publication.

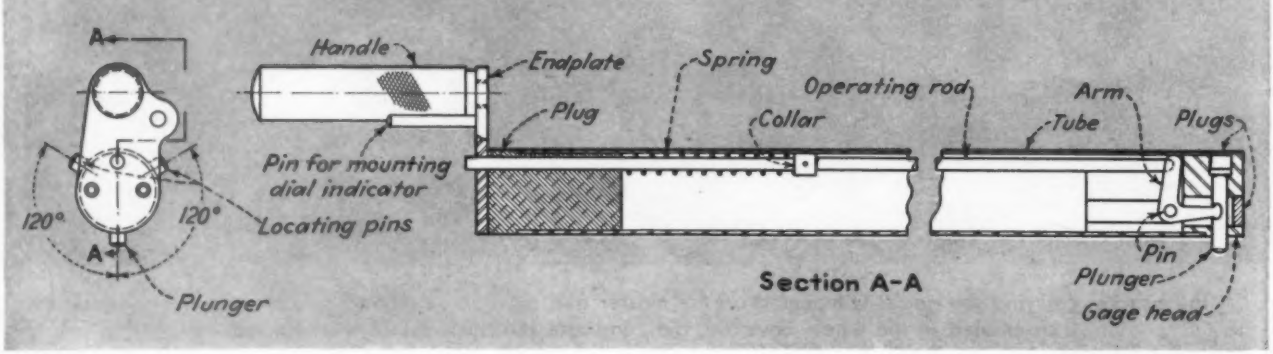
The body of this star gage is a 20.63 in. long piece of 1⅜ × 0.06 in. seamless steel tubing. On the upper end of this tube is a cast duralumin alloy plug, which is press fitted into the end of the tube. This plug is drilled lengthwise with a clearance hole for the 5/16 in. diameter gage-operating rod extending through the tube down to the gaging head. On top of the duralumin plug is bolted an endplate made of cold-rolled steel, through which the gage-operating rod also extends. On one side of the endplate is fitted a 4-in. long knurled steel handle and a ¼ in. pin on which a 0.001-in. dial indicator is clamped so that its spindle contacts the head end of the gage-operating rod.

At the other end of the assembly is a tool steel gaging head into which are assembled two hardened steel locating pins made from ¼-in. diameter drill rod, and a ¼-in. diameter plunger. These three elements are spaced 120 deg. apart around the circumference of the gage head. Each of these elements has a 0.75 in radius spherical head ground on the outer end and they are spaced so that they will fit into a 1.560 in. diameter circle. The plunger is slotted on one side for a slip fit on the ball end of a small bellcrank which turns on a 3/16 in. pin in the gage head. The other arm of the bellcrank has a 90 deg. countersink centered 0.75 in. from the center of the pin hole. Since the ball end on the other arm also is 0.75 in. from the pin hole, this arm moves the gage-operating rod an amount equal to the movement of the plunger when the gage is moved along the bore of the part.



This dial indicator star gage checks the bore of a B-29 bomb-bay door screw, which must not vary more than 0.004 in. from end to end

A bellcrank shown below changes vertical movement of the plunger into horizontal movement of the operating rod. A dial indicator is mounted near the handle of this gage, with its spindle resting on the upper end of the operating rod



The lower end of the rod has a 60-deg. cone point to fit into the countersunk hole in the end of the bellcrank arm. The bellcrank is made from cold-rolled steel, while all of the other parts in the gage head, including the head itself, the two locating pins, the plunger and the operating rod are made of tool steel or drill rod and are hardened to about 63-64 Rockwell C. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Additional Life for Cup-Shaped Grinding Wheels

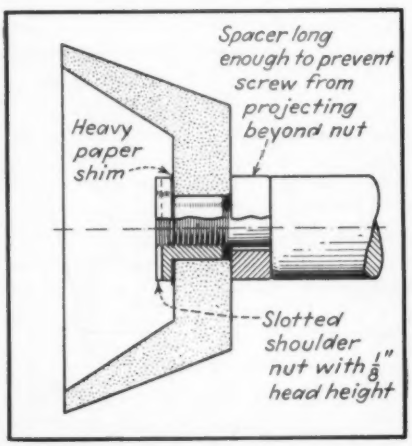
BY EMIL REINHARDT

There is nothing more exasperating than to find a cup, saucer, or dish grinding wheel worn away just enough so that it cannot be of further use because the spindle nut will interfere with the workpiece.

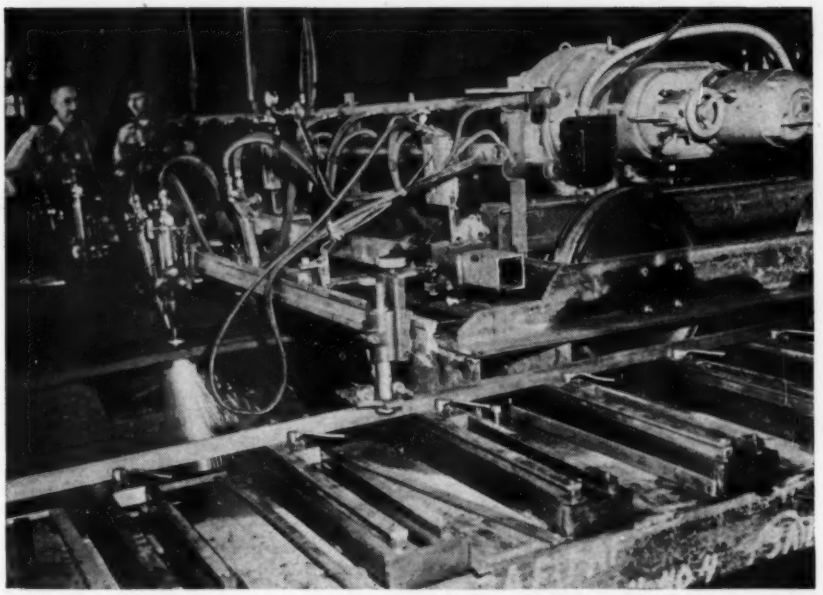
A solution of this problem is to make a nut with a body diameter to fit the hole in the grinding wheel and a thin head, say ⅛ in. thick, with either a slot or flattened sides for tightening.

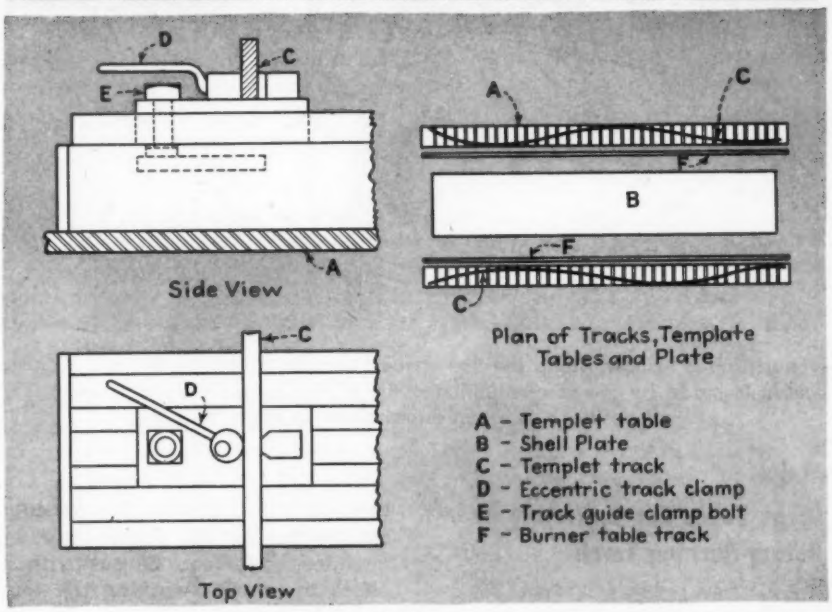
Mounting the wheel on the spindle is like this. A spacer is slipped over the shaft, the thickness being enough to permit the face of the nut head to come flush with the spindle screw, a thick paper washer is placed on the inside face of the wheel, the nut is placed in the wheel hole and then tightened on the spindle.

With this arrangement, the limit of use is the thickness of the head of the nut. The saving is an appreciable item over a year's time.


Spacer long enough to prevent screw from projecting beyond nut
Heavy paper shim
Slotted shoulder nut with ⅛" head height

The wheel can be worn down almost to the base before discarding





Burners are now controlled by a flexible track, insuring repeated accuracy which cannot be obtained by hand methods

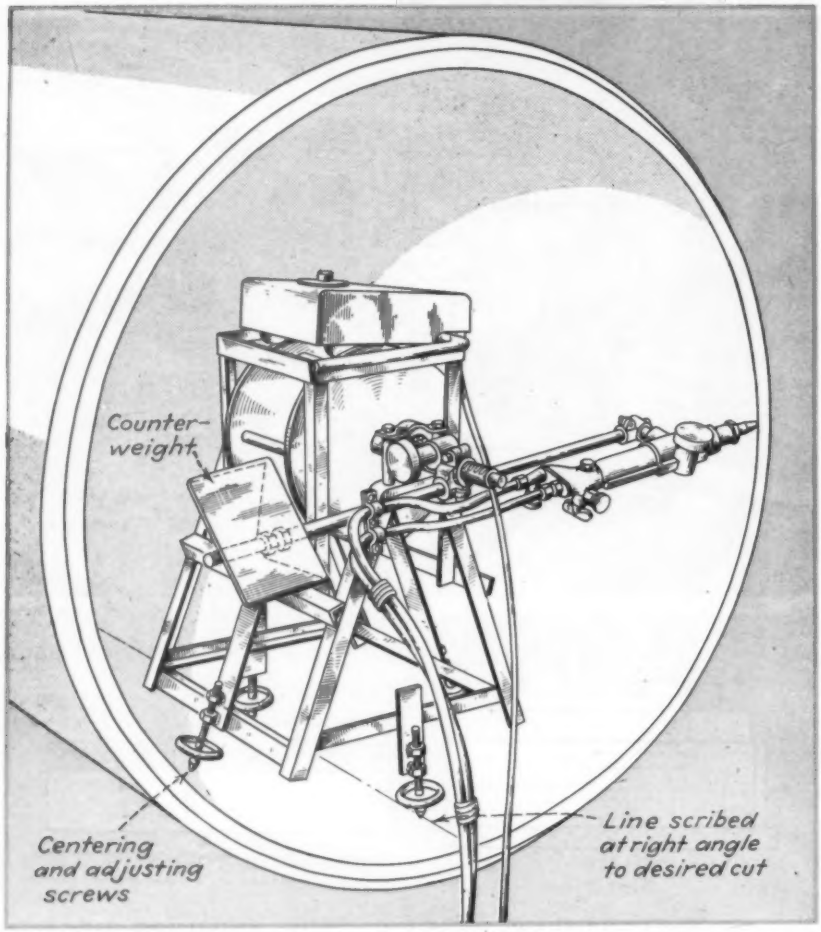
Flame Cutting Free-Flowing Curves By Use of a Flexible Track

By RUSSELL R. RIPLEY
Oregon Shipbuilding Corporation
Portland, Oregon

On each side of the burning table there is a series of templet bars spaced at one-foot intervals; upon these bars a cold-rolled steel track can be secured with eccentric clamps. Laying out ordinates on each bar, from a blueprint, the flexible track becomes a templet which guides the movable burner bars upon which the torches are mounted. Otherwise, the table is not changed.

The process can be used economically provided the curves are not too abrupt for the flexible track.

Contrast this arrangement with the hand-burning method of lofting a templet, then chalking the line on the plate. The results were neither quick nor entirely satisfactory, without considering templets for the hundreds of shapes required. The savings in one case equalled 1,200 manhours per month. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



The stand is located along the line scribed at right angles to the cut. Adjustment is made by the screws until the tip of the counterbalanced torch, for all positions, is at an equal distance from the tube

Large Tubes Cut Uniformly by Rotary-Burning Torch

BY JAMES F. PORTER
Permanente Metals Corporation
Shipyard Number 1

Gas-cutting large tubes by hand presents a problem, especially when the end must be square and even.

For masts of the larger vessels, the cutting line was scribed about the circumference and prick punched for permanence. The resulting edge was ragged and the tube had to be rotated to avoid overhead cutting. When ready for setting, the high spots had to be chipped so that the mast would rest uniformly on the deck, otherwise an excessive amount of welding would be necessary to fill up the gaps.

As shown in the illustration, the counterbalanced torch is mounted on a stand so that it can be rotated through a full circle. Square edges can be cut by the regular tip, but bevelled edges can be cut with an offset tip or by swinging the torch over, as required.

Setting up is rather easy. First, a line is scribed on the inside of the tube parallel to the axis and the two levelling screws placed on it, then the other adjusting screws center the torch.

The cost of the stand is little in comparison to the convenience and economy of operation. *Prize winning suggestion to the company's Labor-Management Committee.*

Outboard Bearing Provides an Arbor Support for Milling Unit

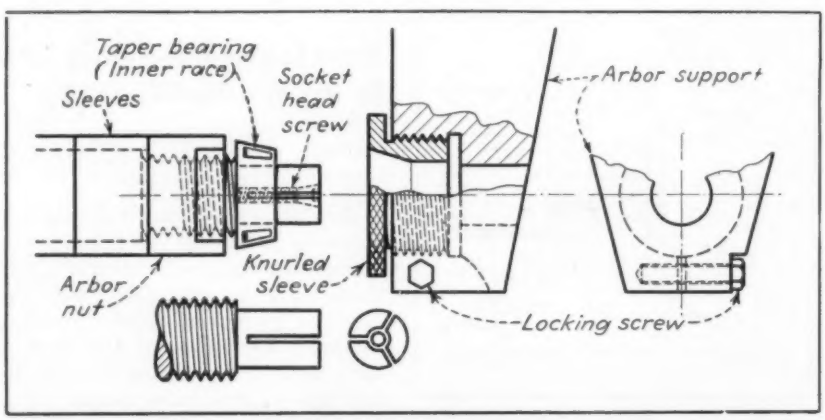
BY C. J. MOLTKE

Quite often, there is too much play in the outboard bearing of the milling-machine arbor to obtain the desired accuracy of finish, so ingenuity must be used to overcome this difficulty. One way to solve this problem is to use the inner race of a taper roller bearing on the supported end of the arbor, the outer race being a knurled sleeve screwed into the arbor support.

The supported end of the arbor can be turned to fit snugly the bore of the inner race. It is drilled and tapped for a hollow-head setscrew, three slots are milled in this end.

The arbor support is bored and tapped to take a hardened knurled sleeve. The sleeve is ground to form the outer race of the bearing.

Cutters and sleeves are assembled and tightened on the arbor; the inner race is slipped on, the hollow-head setscrew turned until the race is tight. The arbor support is bolted in position. Adjustment is obtained by turning the knurled sleeve, the locking screw in the arbor support holds it in position.



This milling machine arbor bearing can be adjusted to eliminate chatter

Simple Indexing of Any Angle—IX

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

N = Holes per Division. ***D*** = Appropriate Hole Circle

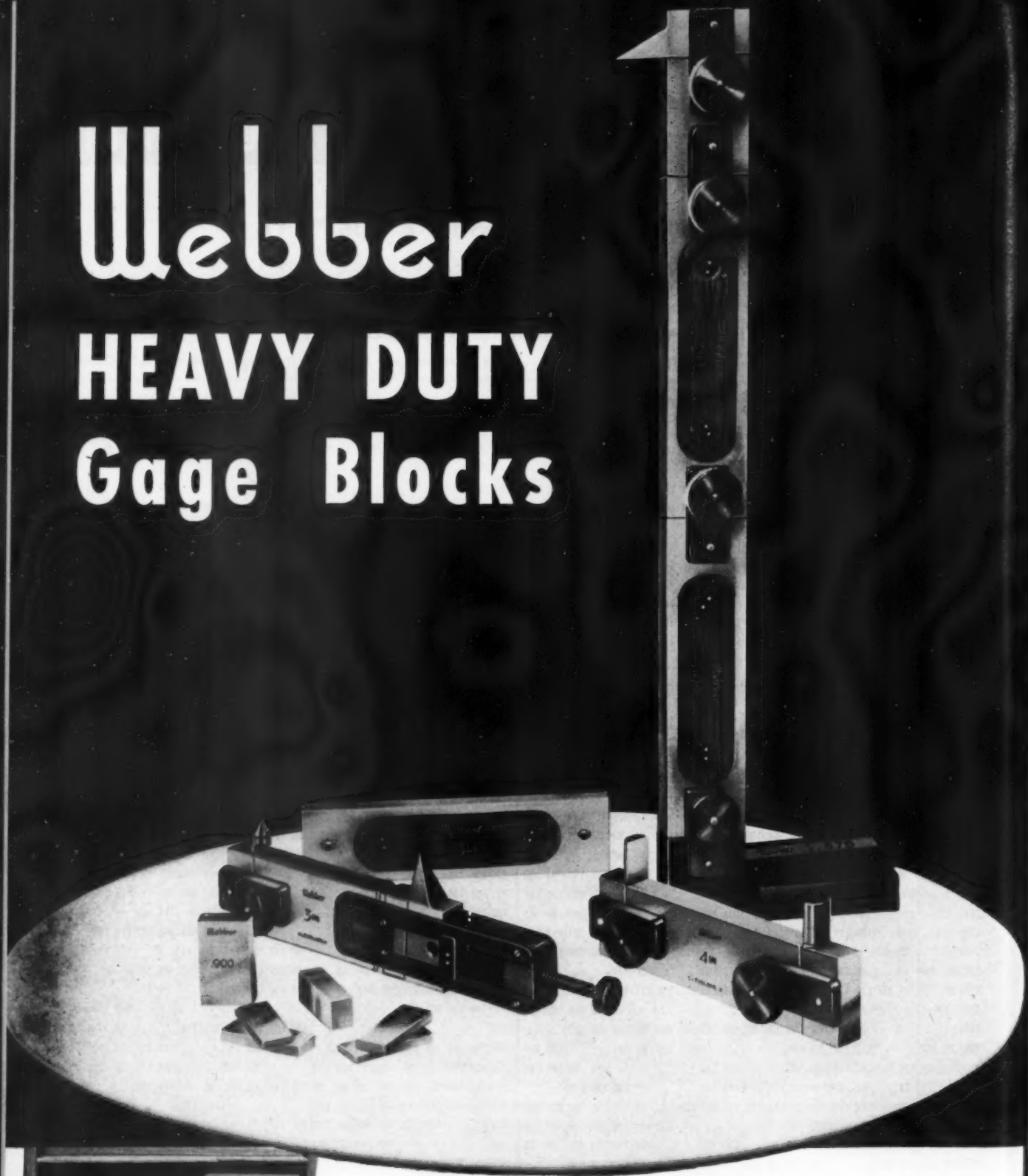
Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.700	140	200									138	197	124	177	103	147	89	127	82	117
.701	68	97	61	87			54	77	101	144	141	201	134	191	127	181	120	171		
.702	106	151	99	141			92	131			85	121			78	111	123	175		
.703	71	101					64	91			140	199			133	189			126	179
.704			119	169	50	71			112	159	31	44	136	193	105	149			129	183
.705	141	200			122	173			91	129	115	163	139	197					132	187
.706					125	177	101	143	142	201			118	167			94	133	135	191
.707	111	157	70	99	128	181	87	123			104	147	121	171					63	89
.708	97	137	114	161			102	144			141	199	124	175	90	127			56	79
.709	134	189			100	141			83	117	127	179			66	93	137	193	93	131
.710	142	200	49	69			76	107	130	183	27	38	140	197	113	159	59	83	123	173
.711			128	180	133	187	69	97	143	201					116	163			126	177
.712			136	191	99	139	52	73	109	153			119	167	129	181			72	101
.713	77	108			92	129	102	143	112	157	142	199								
.714							135	189												
.715	143	200	128	179	108	151	103	144	88	123			78	109	141	187	131	183		
.716	121	169					101	141	144	201	91	127	134	187	129	180	81	113		
.717	114	159			71	99	137	191	33	46	127	177	94	131			117	163	74	117
.718			107	149			130	181	74	103			143	199	23	32	23	32		
.719	110	153	64	89			123	171	100	139			136	189	113	157				
.720	144	200			139	193	103	143	67	93	118	161			129	179	142	197	93	129
.721			106	147			132	183	145	201					80	111	96	133	135	187
.722					130	180					125	173	138	191	86	119	73	101	60	83
.723					128	177	115	159	102	141			144	199			131	181	119	163
.724			62	87					92	127	121	167	50	69			108	149	137	189
.725	145	200			124	171	140	193			111	153			127	175			143	197
.726	53	73	114	157	130	179	146	201			85	117	101	139	117	161	133	183		
.727							136	187									139	191	107	147
.728					75	103	126	173	59	81	110	151	145	199	94	129	129	177		
.729	78	107			132	181	97	133					116	159	81	111			100	137
.730	146	200	119	163	138	189	65	89			141	193					19	26	144	197
.731	125	171	87	119	68	93	147	201	128	175	109	149			90	123	131	179		
.732	112	153			134	183	93	127	52	71	115	157	137	187	74	101	98	131	118	169
.733	140	191					132	180					148	199	124	169	102	139	80	109
.734			127	173	58	79	105	143			130	177			108	147	133	181	61	83
.735	147	200	111	151			25	34	139	189	89	121	64	87	142	193	117	159		
.736	145	197	106	144	120	163	67	91	148	201	123	167					126	171		
.737			129	175	101	137			132	179			104	141	135	183			138	187
.738			31	42			141	191					113	153	147	199			133	180
.739			119	161							88	119	125	169	54	73	128	173		
.740	148	200	131	177	94	127	57	77	134	181	97	131			140	189			143	193
.741	103	139	146	197			149	201			109	147	66	89	112	151			69	93
.742			118	159			121	163			124	167	75	101	127	171	130	175		
.743	133	179	107	144	136	183	139	187	84	113	142	191	87	117	148	199	90	121		
.744					96	129			134	180	102	137			105	144				
.745	149	200	114	153	117	157	120	161			126	169	129	173			132	177	135	181
.746	141	189	144	193	150	201	150	201			53	71					59	79		
.747	95	127	65	87			68	91			74	99	77	103	80	107			89	119
.748	92	123	98	131	104	139	113	151	119	159	128	171	140	187	149	199				
.749																				

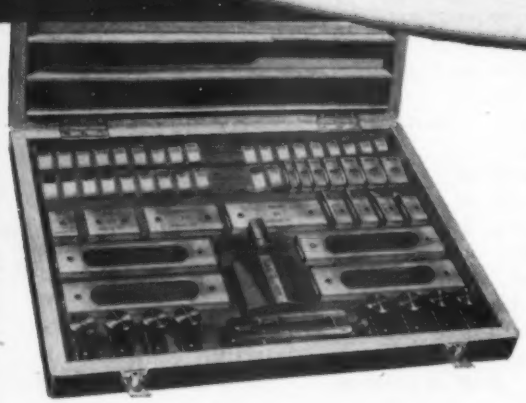
N = Holes per Division. ***D*** = Appropriate Hole Circle

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.750	150	200																		
.751					151	201	142	189	136	181	127	169	118	157	112	149	106	141	100	133
.752			91	121	85	113	82	109			76	101	73	97	70	93	67	89		
.753			61	81	58	77			55	73			52	69	150	199				
.754	144	191	138	183	135	179	132	175	129	171	126	167	123	163	120	159				
.755	151	200	111	147	108	143			105	139			136	180	99	131			96	127
.756			93	123	152	201	149	197	146	193			143	189			84	111	137	181
.757	81	107	134	177	131	173	78	103	129	169			75	99	122	161				
.758	119	157	69	91	116	153			113	149			66	87			151	199	107	141
.759	63	83	104	137	145	191	142	187	101	133	60	79	139	183	98	129	136	179		
.760	152	200			130	171	92	121			127	167	54	71	124	163			35	46
.761	121	159	137	180	153	201			150	197	83	109	147	193					144	189
.762					109	143			77	101	138	181	106	139	135	177			74	97
.763	132	173			29	38	129	169	100	131							152	199	110	144
.764	123	161			94	123	120	157			146	191			143	187				
.765	153	200	114	149					137	179					134	175	85	111		
.766	108	141	154	201	59	77			105	137	151	197			138	180	148	193	125	163
.767	79	103	56	73	145	189	122	159	99	129					78	99				
.768	139	181	53	69	116	151			136	177	83	109	93	121	133	173	153	199		
.769					130	169									147	191	107	139	87	113
.770	154	200	67	87	124	161					141	183	84	109	121	157	111	144	138	179
.771	101	131	155	201	118	153			135	175			152	197	98	127	115	149	132	171
.772	149	193			139	180	78	101	129	167	146	189			34	44				
.773	126	163	92	119	75	97					140	181	123	159	106	137	154	199		
.774	137	177			72	93			103	133	134	173	55	71			117	151	148	191
.775	155	200	131	169	100	129	69	89	145	187	114	147			83	107			142	183
.776			156	201	111	143			125	161	139	179	153	197	80	103			94	121
.777	108	139	150	193													147	189		
.778									130	167	116	149	102	131			88	113	155	199
.779	141	181	127	163	60	77					99	127			139	177	85	109	124	159
.780	156	200	110	141	149	191	135	173			96	123			146	187	57	73		
.781	132	169	157	201	25	32	25	32	143	183	118	151	68	87	154	197				
.782	104	133	140	179	79	101	151	193					126	161			137	175	101	129
.783			148	189	112	143	141	180	123	157	76	97	134	180			87	111	156	199
.784					109	139	120	153	131	167			142	181	113	144	62	78	73	93
.785	157	200	95	121	117	149	139	177	150	191					22	28				
.786	158	201	147	187	125	159	103	131	81	103	70	89					155	197	144	183
.787	133	169			111	141			100	127	152	193	89	113	141	179			78	99
.788			119	151			108	137	149	189			138	175	56	71	127	161	157	199
.789	86	109	116	147							135	171					124	157	94	119
.790	158	200	143	181	113	143			132	167			151	191	102	129			121	153
.791	159	201			72	91			148	187					114	144			156	197
.792			80	101	61	77	145	183			126	159			153	193	88	111	134	189
.793			69	87			142	179	96	121			150	189			77	97	158	199
.794			27	34			139	175	143	180	58	73			120	151			63	117
.795	159	200			101	127	136	171			35	44	144	181	74	93			152	191
.796	160	201	82	103	125	157	86	108	133	167	90	113	141	177	98	123	148	187	157	197
.797	106	133	55	69	114	143			122	153	63	79	138	173			146	183	154	193
.798	79	99			87	109	95	119	103	129			115	144	127	159	135	169	151	189
.799	159	199																		

Webber

HEAVY DUTY Gage Blocks





The above shows the assembly of **WEBBER HEAVY DUTY** gage blocks into practical, accurate measuring tools. Webber Heavy Duty gage blocks are not only a set of precision standards but are quickly assembled into a precision HEIGHT GAGE . . . an inside or outside CALIPER or a DIVIDER, which brings to the tool maker a new precision in layout and inspection work. These extra large . . . man size gage blocks have such generous wearing surfaces that lasting accuracy is assured. It takes only a matter of seconds to assemble these tools ready for use. Think of your satisfaction . . . measuring tools in a range from .300 to 24.000 or 36.000 and by the addition of extra 6.000" blocks, the possible extension of these features up to 100 inches or more . . . all within accuracies of millionths of an inch. The 6.000" blocks are fitted with inserted walnut insulation strips . . . thus when handling, heat from the hands is kept from the gage itself.

THE GAGE BLOCK SET OF TOMORROW . . . HERE TODAY.

Set No. H. D. 24 - Range from .300 to 24.000 in steps of .0001" $385.00
Set No. H. D. 36 - Range from .300 to 36.000 in steps of .0001" $450.00

WEBBER GAGE CO.
12901 TRISKETT ROAD
CLEVELAND 11, OHIO

Simple Indexing of Any Angle—X

BY CHARLES HAVRANEK, FOREMAN, TOOL DESIGN DEPARTMENT, ARMA CORPORATION

HOLE CIRCLES FOR DECIMAL TURNS OF INDEX CRANK

N = Holes per Division. *D* = Appropriate Hole Circle

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.800	160	200																		
.801	161	201	145	181	137	171	121	151	113	141	105	131			97	121	89	111		
.802	158	197	150	187	73	91	142	177	134	167	126	157			118	147	67	71	110	137
.803			155	193			147	183	139	177					131	163			123	153
.804	160	199	78	97	152	189	37	46			144	179	70	87	136	169			99	123
.805	161	200			62	77	91	113	120	149			145	180	141	175	112	139	162	201
.806	162	201			104	129	154	191							146	181				
.807	159	197			67	83	88	109	130	161	151	187			21	26			143	177
.808			80	99	156	193			125	167	114	141			148	183			127	157
.809	161	199			140	173					153	189					132	163	89	121
.810	162	200	64	79	111	137					124	153	137	169			90	111	163	201
.811	103	127	146	180	116	143	129	159	142	175			155	191					82	101
.812	108	133	121	149	147	181					117	144					152	187	139	171
.813	100	123	87	107	74	91			157	193			144	177					105	129
.814	162	199			149	183			136	167			123	151			154	189		
.815	163	200	97	119			129	157			84	103	146	179			31	38	164	201
.816	133	163	71	87			120	147			138	169			147	180	156	191	68	71
.817	125	153	143	175	161	197					112	137	130	159	148	181				
.818					153	187							158	193	140	171	122	149	104	127
.819			163	199	145	177	58	83	118	144	109	133			150	183	91	111	132	161
.820	164	200	155	189	73	89			137	167	96	117					142	173	165	201
.821			101	128	147	179			23	28					129	157	83	101	60	73
.822			157	191	148	180	162	197	88	107	139	169			116	141	144	175		
.823	93	113	121	147	149	181					154	187					159	193	131	159
.824			164	199	75	91			108	131			141	171	80	97	113	137	146	177
.825	165	200	151	183	118	143			156	189	123	149			90	109	166	201		
.826			133	161			138	167	119	144	143	173					148	179		
.827			110	133	67	81	158	191	163	197			72	87			149	180		
.828	130	157			135	163	82	99	140	169			145	175	150	181	92	111	155	187
.829	160	193	165	199			102	123			107	129					117	141	122	147
.830	166	200	127	153	132	159			142	171	147	177	152	183	157	189	167	201		
.831	69	71			64	77	69	83			74	89			84	101	89	107	94	113
.832			114	137	124	149	144	173	149	179	164	197								
.833							150	180												
.834			166	199	156	187	151	181	136	163	116	139	111	133	101	121			91	109
.835	167	200	81	97	76	91			66	79			61	73			168	201		
.836	158	189	153	183	148	177	143	171			133	159	128	153	123	147			118	141
.837					108	129			103	123	165	197	98	117			160	191		
.838	150	179	145	173			140	167	83	99	135	161			78	93			151	180
.839			73	87	167	199	162	193	115	137	68	81	157	187	110	131	152	181		
.840	168	200			142	169	121	144			137	163	59	69	95	113	169	201	37	44
.841			127	151			159	189			154	183	85	101	117	139	149	180		
.842			144	171							107	127	166	197	75	89	134	159		
.843	161	191	129	153					70	83	124	147	151	179	27	32	27	32	146	173
.844	119	141			168	199	141	167	152	180	162	193			136	161			158	187
.845	169	200	60	71			153	181	82	97	104	123	126	149	170	201				
.846			143	169	121	143							160	189	116	137	94	111		
.847	155	183	133	157	122	144	111	131			150	177			167	197	39	46		
.848	145	171	67	89	162	191					84	99			101	119			118	139
.849			152	179	169	199	62	73			79	93	113	133	164	193				

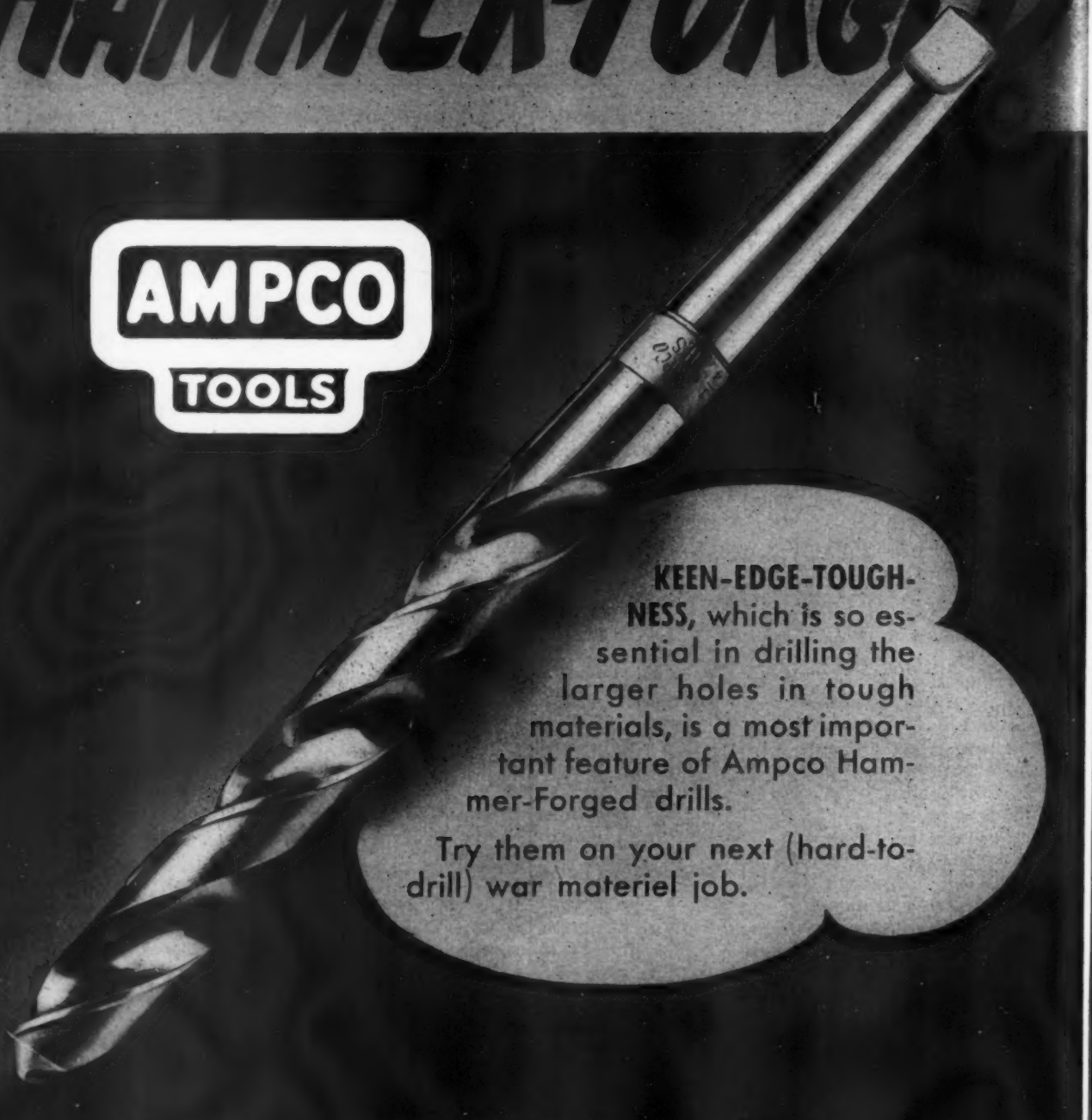
N = Holes per Division. *D* = Appropriate Hole Circle

Turn	0		1		2		3		4		5		6		7		8		9	
	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D	N	D
.850	170	200					159	187	106	127	91	107	74	87	171	201	154	181	137	161
.851			120	141	103	121			149	175	86	101							161	189
.852	144	169					127	149	156	183					110	129	168	197	29	34
.853			151	177	93	109					163	191			105	123	146	171	76	89
.854	117	137			170	199	129	151	88	103					153	179			165	193
.855	171	200	59	69			136	159	148	173			160	187	172	201			95	111
.856			119	139	131	157	143	167	155	181										
.857			162	189													168	197	157	183
.858	145	169			121	141	109	127	97	113			85	99	164	191	152	177	140	163
.859			128	149	61	71	171	199			104	121			147	171	92	107	135	157
.860	172	200	123	143	80	93	154	179			111	129			173	201	68	79	161	187
.861			155	180	149	173	118	137	87	101			137	159					106	123	156	181
.862			75	87			144	167	163	189			113	131					151	175	170	197
.863	63	73					139	161	158	183			38	44							165	191
.864			89	103	70	81	172	199	153	177			2		115	133					96	111
.865	173	200			167	193					148	171	174	01	174	201	129	149	155	179
.866	84	97	110	127	136	157	162	187							156	180				
.867	150	173	124	143			98	113	157	181	131	151			164	189	105	121	138	159
.868	171	197	125	144	112	129	145	167	33	38			152	175	86	99	159	183	159	183
.869					93	107	173	199			140	161	40	46			147	169	107	123
.870	174	200	154	177	121	139			168	193			175	201	128	147				
.871					142	163	149	171			156	179	163	187			102	117		
.872					157	180	123	141			130	149	137	157			151	173	166	191
.873	165	189	172	197	62	71			67	79			76	87			90	103	97	111
.874	111	127	125	143	146	167	174	199	167	191										
.875	175	200											176	201	155	177	141	161	120	139
.876	113	129	99	113			65	97	78	89	71	81			64	73				
.877	164	187	157	179	150	171	143	163			129	147			122	139	158	180	115	131
.878	108	123	173	197			166	189			159	181	152	173			87	99		
.879	138	157	80	91	131	149			175	199	73	83	168	191	117	133	161	183		
.880	176	200			147	167	108	117	81	92	140	159	177	201	96	109	170	193		
.881	37	42	126	144	89	101			156	177			149	169	82	93			127	144
.882	142	161					165	187	135	153					158	179			98	111
.883	151	171	68	77	174	197	159	180	144	163	91	103	167	189	114	129				
.884	160	181					153	173	176	199			23	26					169	191
.885	177	200	77	87	162	183	139	157			178	201			155	175			132	149
.886	171	193	70	79	148	167			39	44	125	141	86	97			141	159		
.887	157	177			118	133	63	71	134	151			150	169	166	187	95	107	95	107
.888			127	143	143	161	175	197											168	189
.889									177	199	161	181	145	163			113	127	97	109
.890	178	200	170	191					65	73	179	201			163	183	106	119		
.891			172	193	131	147	41	46	156	175	115	129	74	83	140	157			99	111
.892			124	139	149	167					83	93	133	149	158	177			25	28
.893	167	187	142	159	92	103			176	197	151	169	126	141			160	179		
.894	135	151			169	189	110	123	178	199					153	171				
.895	179	200	128	143					171	191	180	201			146	163	129	144	155	173
.896			69	77	164	183	173	193					78	87					87	97
.897			157	175	96	107			105	117			114	127	123	137				
.898	132	147	141	157	150	167	159	177	168	187	177	197	62	69	71	79			80	89
.899	89	99	98	109	116	129	134	149	161	179	179	199								

(This table will be continued in an early issue)

HAMMER-FORGED

AMPCO TOOLS



KEEN-EDGE-TOUGHNESS, which is so essential in drilling the larger holes in tough materials, is a most important feature of Ampco Hammer-Forged drills.

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Gaging Business

Tools For Reconversion

Upon successful conclusion of the European war, machine tool builders are likely to be given the "green light" to proceed with manufacture of key machine tools that will be required for the reconversion of American industry to civilian goods production, according to top-flight Washington officials. So far as one can see ahead, the war demand for machine tools will subside considerably after VE-Day, and the slack will be taken up by permission from WPB to make postwar machines.

Two purposes are behind this program now in the making. One is the desire to shorten as much as possible the time between a lapse in war production and resumption of civilian goods manufactured by American industry. The other is the precaution of keeping machine tool builders busy enough so that if new war needs suddenly crop up later in the Japanese war, capacity will be available immediately without the necessity of recruiting an organization or of rebuilding a working force.

Unrated Business Heavy

At the end of January, the tool industry had some $95,000,000 in unrated orders on hand, and about $45,000,000 of this was for the auto industry. However, the need to make delivery against urgent military and Russian orders has only permitted a small trickle of unrated tool shipments to users for several months now. When the "wraps are off," however, after VE-Day, the industry is expected to have plenty to do for a number of months. Accordingly, users requiring machines that will take a long time to build are placing their orders early, to guard against tieing up civilian production for lack of such machines.

Record Ordnance Output

Over-all production of ordnance materiel for the Army reached a new peak in March. Output of Navy ordnance is approaching the anticipated peak, and will attain it early in the second quarter. The top in non-expendible items was gained some time ago, but the high spot in expendible materiel is yet to come. High-capacity projectiles and rockets are the two most important items at the moment, with rocket production scheduled to soar to over $90,000,000 a month by next December. No decrease is expected in Naval ordnance production after the German war.

Truck Program Cut

The military truck program is being cut down because of a shortage of certain component parts, which are in greater demand as replacements in the field than for installation in new trucks. A choice had to be made between the two, and replacement needs won out. Tire production has surprised Washington officialdom by rising 30 percent this quarter, as compared with a predicted five percent. Current production of some communications equipment has been slowed down while changeovers have been made to new designs. The war production goal this year is $66,000,000,000, as compared with $63,000,000,000 in munitions for 1944. Some of the production programs are mounting at a fantastic rate. They are taking more men and materials than the equivalent dollar volume of production in 1944. In a few items, the needs are expanding faster than output is increasing. Chief worry, that will continue until VE-Day, is manpower.

Weather Upsets Shipments

January deliveries were held up at the plants of some tool builders on account of snow. This means that February shipments were moderately aided by the carry-over from January, although this was more than offset by the fewer days in that month. However, March floods interfered with some tool production, and chances are that shipments this month, too, will be restricted. Thus, first quarter shipments will do well to average $37,500,000 per month. The big programs for artillery shell, rockets and jet-propelled engines are well along.

$450,000,000 Year

Barring the end of the European war, machine tool production this year probably will amount to $450,000,000. With VE-Day, however, will come cancellation of some machine tool orders, though this will be offset by orders for machines for civilian production. If Germany capitulates this summer, the combination of war and postwar orders is likely to maintain machine tool production up close to the current level. Employment in tool building registered a gain of 1,500 between December and January.

Foreign orders are not to be forgotten in machine tool calculations. Russia wants $120,000,000 in machine tools for the present protocol year, ending June 30, 1945, but will be fortunate in getting $60,000,000 by that time. However, she will extend whatever orders are not filled this year. In addition, France is trying to buy $100,000,000 in American machine tools on a long-term credit basis.

—Associated Press

Floods Handicap War Work—March munitions output will reflect disruptions to war production caused by floods which hit Ohio and Pennsylvania plants hardest. At Leetsdale, Pa., the American Bridge Company's outfitting dock was flooded, as shown here, thereby interrupting work on the building of landing craft

French Planning To Buy $100,000,000 In New Machine Tools

Require tools to rehabilitate French industry. But if American delivery is delayed, France may purchase tools from British builders, who can make early delivery

WASHINGTON—The French Purchasing Commission has plans for securing in this country $100,000,000 of new machine tools to help rehabilitate the heavy industries of France. The transportation industry is the first one, and the most urgent, for which machines are required. Though the program for machine tools is part of the lend-lease agreement signed recently by the American and French governments, the French expect to pay for all the machines obtained in the United States. Terms are reported to be 20 percent cash and the remainder to be paid on a long-term basis that may run 15 to 20 years, with interest. The financing would be done by one of the U. S. government agencies. Machine tool builders thus would be paid for their machines upon delivery.

Require High-grade Tools

The kind of machines that the French desire are pretty much the same type that the Russians want and are getting—high grade general purpose machines. To date the French have had no success in securing priorities that will enable them to get deliveries soon. Very little of the business has actually been placed. It is understood that lists of tools needed for specific shops are now being prepared. This method of procedure will be looked upon more kindly than submission of lists of machines without indication of where they are to be used and for what purpose. If the French expect to get machines soon for transportation shops, they have the task of convincing the U. S. Army authorities that they must have them and thereby divert them from other war customers.

British Controls Lifted

French officials in this country point out that a few weeks ago rigid controls were removed from the British machine tool industry by the British government, and British tool builders can take business from France for relatively short delivery. If the French are too long delayed in getting here what they must have, they will be compelled to go to Britain for a portion of it. They admit, however, that some of the machines they are seeking cannot be supplied except by American builders. Before the war the French imports of machine tools were broken down as follows: 58 percent from Germany, 22 percent from the United States and 8 percent from the United Kingdom.

Some machine tools of simple design are being made in France at present. The machine tool industry there, however, is small, numbering not more than 7,000 workers.

Resistance Welding Contest

PHILADELPHIA — The Resistance Welder Manufacturers Association, 505 Arch Street, are running a $1,000 Prize Contest for papers on resistance welding. One $500 prize will be given to the best paper on design for resistance welding submitted by an industrial source, consulting engineer, government laboratory; one $200 prize will be given for the greatest original contribution to the advancement and use of resistance welding by a university source, and another $200 prize on the same basis from an industrial source; a $100 prize will be awarded to the best runner-up in any of the three categories.

Further details of the contest may be secured from the Resistance Welder Manufacturers Association.

Lincoln Electric Releases New Arc Welding Sound Film

CLEVELAND — The progress and future prospects of arc welding are portrayed in a new technicolor sound film being released by the Lincoln Electric Company. Entitled, "Magic Wand of Industry—Arc Welding," the film was produced under the direction of Lincoln welding engineers at the request of the U. S. Bureau of Mines.

Arc Force Shown

The 25-minute presentation reveals for the first time the true action inside the arc, showing the penetrating "arc force." It is available in 16 mm. and 35 mm. prints to business groups, technical societies, schools, colleges, and industrial plants at no charge except transportation. It may be obtained from The Lincoln Electric Company, 12818 Coit Road, Cleveland 1, Ohio, or from the U. S. Bureau of Mines, Experimental Station, 4800 Forbes Street, Pittsburgh, Pa.

AAF Places Jet Parts Orders Running into Millions

CLEVELAND—It is reported that Thompson Aircraft Products Co. has received over $100,000,000 in jet propulsion engine parts orders from the Army Air Forces, and similar large orders have been placed with at least four other Cleveland companies. Jack & Heintz, Inc., Cleveland Pneumatic Aerol, Inc., Tinnerman Products, and Steel Improvement & Forge Co., also shared in the business. Moreover, Timken Roller Bearing Co., in Canton, Ohio, is said to have an extensive jet part contract, too.

According to J. D. Wright, vice-president and general manager of Thompson Aircraft Products Co., the AAF permitted disclosure of the new business (without specifying amounts), to quell rumors being circulated as a result of extensive changes of manpower and machinery at the plant prior to going on a two 12-hour shift basis. Tapco has been carrying on extensive research and development on jet turbines for three years.

Portable Generator Sets to Supply Power to War Areas

CLEVELAND—To speed their task of restoring utility services in liberated and occupied areas, U. S. Army engineers have orderd portable diesel generator sets to supply power to devastated areas. George W. Codrington, General Motors vice-president in charge of Cleveland Diesel division, announced that the units were in production in large numbers.

The sets are mounted on skids to ease moving, and may be hauled by rail or truck, or towed along the ground. Two different sized engines are specified, to which may be hooked up three different generators. On a large 12-cylinder engine, a 418-kw generator is used, while an 8-cylinder engine powers a 248-kw and a 167-kw generator.

Mobility and Economy

Army and Cleveland Diesel engineers worked out the designs, with mobility and economy of operation as primary considerations. Peacetime applications are envisioned in fields which have been handicapped by lack of power, line service, such as mining operations, in oil fields, agriculture, logging, and other industries.

Inside Detroit

Committee Uncovers Strife

If the testimony produced at the recent Mead Senate war investigating committee is an indication, the automobile industry is in for some heavy post-war labor strife.

The testimony developed at the three-day hearings here in which Senator James Mead (D-N.Y.), Senator Homer Ferguson (R-Mich.) and Senator Hugh Mitchell (D-Wash.) participated, was nothing new. The charges and counter-charges had been flung at each other by both labor and management on every occasion, whether it was at wage bargaining meetings or telegrams urging the Mead committee to come here.

Little Industrial Harmony

But what awed impartial spectators at the hearings was the underlying bitterness expressed in remarks to the committee, despite pleas for harmony and unity. Labor's distrust of management's motives was reiterated; management's assault on labor's aims to encroach on supervision was re-stressed and both took roundhouse swings at the government's shortcomings toward both.

Labor assailed the wage freeze, the failure to schedule work to keep everyone working, and slowness to settle grievances that contract procedure couldn't cope with. Management bitterly spoke of "lop-sided labor policies" in Washington which put it at a disadvantage when dealing with abuses in its plants.

Loafing, Hoarding Revealed

Testimony brought out at the hearings definitely showed idle equipment, loafing on the part of workers, hoarding by some employers, a woman labor surplus and a great doubt that any manpower shortage ever existed in Detroit, despite its classification as a No. 1 critical area. But who is to blame for this situation is still confused.

Idle equipment was known to the services, it was made clear. Chevrolet Forge had shell-making equipment but it was in disuse. Meanwhile another shell plant was being built in St. Louis. But, said the head of the forge department, its equipment was outmoded, space requirements were not sufficient.

A surprise visit by the committee to Packard—surprise to the workers but not to management—caught a worker asleep on a conveyor, two more playing checkers, nearly 200 others standing by shut-down machines 45 minutes before quitting time. Shocked, belligerent Senator Ferguson subpenaed them to the hearing, asked them why and wherefore.

"We finished our quotas, cleaned up our machines, there was nothing else to do," the workers told him.

Union Blames Management

International union officials shouted that it was not their members' fault that this condition prevailed. It was in other plants too, but management had hoarded labor, had taught them loafing and had condoned it.

Rugged, forthright George T. Christopher sat an entire day listening to this testimony. Like others, he may have wondered why he was being singled out. Late at night, he was called to testify.

Christopher had heard union leaders charge that from the cooperative attitude of last year his management had begun labor-baiting.

"The present president of the Packard local has no executive ability," Christopher answered. "There are two factions now fighting among themselves and you can't deal with two groups."

Christopher offered no defense to the hoarding charge, none to the loafing. But following the hearing, he intimated that Packard would assume a new attitude on conditions in the factory. "The union has pointed out our responsibilities," he said.

Seniority Rule Developed

The one constructive achievement of the committee, in retrospect, was the cumulative seniority agreement which it forced out of the War Manpower Commission's labor-management advisory committee.

The question of cumulative seniority had been the stumbling block in the path of transfer of skilled workers from one plant to another. The workers resisted, preferring to take menial jobs in their own plants in order to preserve their seniority.

The change enables them to take jobs at their highest skills and still accumulate seniority in their new plants. The retroactive clause, which would give the same right to workers already transferred, is being worked out now by WMC. It probably will apply since Dec. 10, 1942, when the area job stabilization plan went into effect.

Otherwise, the committee left conditions where they found them. True, there will be a stiffening on the part of management towards loafing on the job. But the mutual distrust, the workers' resentment of changed time standards is still rooted here.

—Wide World

Veterans Rehabilitation—World War II veterans working in this machine shop at Camp Legion, Dearborn, Michigan, are being aided to return to a useful civilian life in their chosen field of work within three months. Progress records are kept, taking into consideration the veteran's adaptability and his chosen field of interest

Industry to Provide 30% More Jobs After War, NAM Survey Shows

NEW YORK—Industry will provide 3,400,000 to 4,400,000 more jobs after reconversion to peacetime production than it did in pre-war 1939, representing a 30% minimum rise, according to results of a survey taken by the National Association of Manufacturers. In making public survey results, Mr. Ira Mosher, NAM president, pointed out that the manufacturing industry employed 10,600,000 persons in 1939.

The survey results were based upon plans reported by 1,700 individual manufacturers to the NAM, and revealed that several million workers now in the labor force will permanently withdraw from gainful employment in manufacturing industries. This and other conclusions arrived at after studying survey results dispel the specter of nation-wide unemployment after the war, according to the NAM.

Mr. Mosher stated, "Manufacturing normally employs about 25 percent of the total working force of the nation. Should the other elements of the economy be able to make similar increases in employment we would have about 56,000,000 individuals working in our stores, farms, in trades and services, civil service, and in the other activities that make up our national life. This volume of employment depends upon a favorable economic climate, upon how quickly the government lifts its ban on reconversion, and upon a national confidence shared by all elements of our society."

Unemployment of 1,416,000

The survey discloses that on the basis of plans of industry, transitional unemployment will only amount to 1,416,000, and that only for a relatively short duration staggered over several months. Most companies will be able to shift over to peacetime activity with no loss in production time at all.

The study indicates that 79 percent of manufacturing companies will employ more persons than they did before the war, 16 percent will employ the same number and five percent will employ less. Small companies will show the sharpest job gains; those with less than 100 employees expect to go to 71 percent above the prewar level. Medium-size companies, with from 100 to 5,000 employees, expect a gain of 32 percent, and big companies anticipate a 24 percent increase.

Canada's VE-Day Cutback to be 35%; Labor Efficiency Up 33%

OTTAWA—Despite talk in the United States that war production there may be reduced by 20 percent or less on Germany's defeat, Canada's plans envisage a 35 percent cutback "across the board." This was brought out at the first press interview of Hon. C. D. Howe, new Minister of Reconstruction. It was also brought out that Canadian war production was at the all-time peak rate of $3,000,000,000 per year, even though the labor force has been reduced from 1,000,000 to 750,000, indicating a 33 percent increase in labor efficiency.

Reconversion Differences

The government's goal in reconversion was stated to be "the greatest possible measure of employment," as against use of the earlier term "full" employment, now being widely used in the United States. Canada does not expect any mass unemployment after VE-Day, and is it believed that there will be little or no need for public works projects to stimulate employment. However, some "regional" problems are expected, and special Regional Councils have been set up to handle them.

Canada's Reconversion problems are somewhat different than those of the United States, since the Dominion is affected by conditions in Britain, as well as in the United States. Late in 1944, after Britain cancelled many of its Canadian contracts, Dominion industry was well along on reconversion until heavy munitions orders from the United States poured in, early in 1945. Some washing machines and other consumer goods was produced during the slump in war business.

Otherwise, Canada is likely to maintain her controls on industry after VE-Day only to the extent necessary to cope with special shortages, which is reported to be the plan in the United States, and the Dominion may also maintain price controls at least until the end of the Japanese war.

Truck Bookings Down 75%

CHICAGO—January, 1945, bookings of electric industrial trucks and tractors at $946,045 were 75 percent below the $3,935,001 reported for December, 1944, according to the Electric Industrial Truck Association. However, the January figure brought bookings close to November's level of $985,834. Cancellations of orders on the books of manufacturers continued moderate, with those for January approximating $20,000.

WAR CONTRACT BAN LIFTED AS COAST MANPOWER EASES

SAN FRANCISCO—Significant of the changing manpower situation on the Coast is the raising of the ban that has heretofore prevented firms in West Coast labor shortage areas from bidding on new war contracts. Larger contracts, or those that involve increase in the manpower ceilings of the bidding firms, must have prior approval of the local production urgency committee, but discrimination against local bidders with available facilities has been removed.

Manpower shortages are now resolving themselves into specialized needs of individual firms, and the entire end of the labor shortage here may not be far off. In fact, there may soon be a surplus, unless large-scale developments not now foreseen occur in placing war contracts.

Lowered requirements of Coast shipyards are chiefly responsible for the change. Most yard schedules call for slower completion of remaining ship construction, and some of them are being diverted to repair and renovation work, thus reducing their requirements for unskilled labor. In Portland, Oregon, yards, where sizable lay-offs have already occurred, it is estimated that some 80,000 of the present labor force of about 100,000 will be laid off by the end of the year, mostly in the last quarter.

Unemployment To Be Heavy

The imminence of a more or less grave situation in Portland brings closer to home the "inevitable economic shocks" predicted for California by the Reconstruction and Reemployment Commission. This report pointed out that the total labor force of the State increased from 3,000,000 in 1940 to 4,000,000 in 1943, more than any other state, and estimated that there will be, within the state, from 700,000 to 1,000,000 more job seekers within a year after general demobilization than there were during 1940; and that during that first year after demobilization unemployment may go as high as 800,000 persons, double the number of unemployed in 1940.

Wartime Washington

Reconversion Planning

One might get the impression from reading the newspapers that no reconversion planning is going on in Washington. This is not true. Some time ago, the War Production Board submitted a plan to Mr. Byrnes' office to be put into effect after VJ-Day. More recently the plan has been revised, on the basis of estimates of military needs by the services, to apply after VE-Day. As long ago as last fall, certain industries were asked by WPB to devise and file in Washington their programs for their own industries. WPB officials are now in process of examining these programs in the light of recent developments to see what changes should be made in them.

One point needs stressing: the requirements of the services after victory over Germany will not be cut down so drastically as earlier anticipated and the cancellations and cutbacks will be more gradual. Every effort will be made by WPB at that time to restore production of civilian items in the shortest supply. Top WPB officials are not so naive as to believe that the war is going to last forever; nevertheless, they subscribe to the opinion that the best insurance for a short war is to plan for a long one. That is why they have been willing to go along with the Army and Navy in stripping the civilian economy down to almost nothing. Loud roars of protest and denial go up at any suggestion that WPB may at present be under the thumb of the Army; and the denials seem genuine and justifiable.

WPB Still Can Fight

WPB doesn't always agree with the services in "cutting to the bone" civilian goods. In one instance, the services insisted that the stocks of one vital raw material be held at the current minimum level. WPB, in turn, took the position that the further paring of stocks was necessary to fill an essential civilian requirement. And WPB stood by its decision, despite violent objections by the military.

Steel and lead probably are causing more headaches in Washington than any other materials. Steel, in fact, never has been so critical, especially in the higher grades of carbon steel and in alloys. Not long ago, some people were bewailing the excess capacity for making alloy steel that had been built up in recent years, but the immediate requirements of critical war programs promises to engage almost all this capacity.

Materials Cause Headaches

Main trouble in steel is the lack of 50,000 workers to replace lost manpower. The industry is now hovering around 95 percent operations; it will be extremely difficult to shove output much higher. The only solution to the lead problem is to put more men to work in the mines and the smelting plants.

Even with full allowance made for shortages of steel and lead, the civilian economy will be more seriously affected by the constantly diminishing supply of textiles and lumber. Copper has been getting increasingly tight. There is plenty of capacity in aluminum, but the task today is to secure adequate manpower to run the plants that are being put back into operation after having stood idle for months. Worst spot is in extrusion operations.

Shortages of carbon black and of rayon cord have been holding back rubber tire production. The curtailment at Akron to a six-day week was accomplished with considerable trouble. During April it is believed that materials will be on hand to enable resumption of seven-day operation.

Wallace-Vinson Team

The appointment of Henry Wallace as Secretary of Commerce, and of Fred M. Vinson, former Director of Economic Stabilization, to the position of Federal Loan Administrator, sets the stage for some interesting experiments in the operations of the Commerce Department and RFC. Both men have reiterated the president's pledge to provide 60,000,000 jobs in postwar, and to use their offices toward that end.

The fact that some 63,000,000 persons were engaged in peak wartime activity, including some 11,000,000 men in the armed forces and millions of extra men on the federal payroll, means that Wallace and Vinson may have to scare up a minimum of 10,000,000 extra jobs for postwar to take up the slack of returning servicemen and curtailed war agencies, let alone any slack that may occur in certain industries.

PUBLIC PAYROLLS SUPPORT 28% OF TOTAL EMPLOYED

NEW YORK—Although total employment reached a level of 63,072,000, including members of the Armed Services, in December, 1944, the National Industrial Conference Board estimates that members of the Armed Services and workers on federal, state, and local payrolls comprised 17,600,000 persons or 28 percent of total employment. Civilian workers on public payrolls were estimated at 6,100,000, representing a 49 percent rise from December, 1939 levels. This represents more than one-ninth of the 52,000,000 civilian workers in the United States at the year-end.

—U. S. Signal Corps

Underground V-1 Factory—Allied liberation of France foiled Nazi heavy production of V-bombs in this plant located in an old iron mine. These milling machines along the side of a tunnel represent a small part of the factory, which employed 8000 Todt workers to turn out 200 V-1s daily

Spotting the Air News

Private Plane Prospects

If personal flying is accepted on a large scale in the United States, it will be taken up on a comparable scale in other progressive countries throughout the world. Thus, it is possible that the light airplane and rotorplane market will be much larger than the prophets have been talking about.

A big export market for light aircraft depends secondly upon American aptitude for mass production. If the light plane industry reaches substantial comparability with the auto industry here at home, it is hoped that export would follow in like proportion.

With Japan and Germany out of the running (as they certainly will be in the aircraft line), only England and Russia remain as foreseeable competitors in personal aircraft production. France and Italy have both displayed some skill in automotive design, but chances of their getting into volume on any line of equipment are very small. Of course, several countries like China, Brazil, and India have impressive potentialities in resources and manpower if exploited some distance in the future.

British Position Uncertain

The British, in the opinion of visiting American engineers, have done well in volume production of war equipment, particularly in airplanes. Considering their comparative resources, population, and interference by combat, they did as well or better than the United States in aircraft. From that source must be deducted, however, the fact that their motivation was much stronger than ours, and also that they were not producing on a comparable scale in many other lines, as was being produced in the United States.

Whether they turn out volumes of small aircraft, at low prices, for themselves and for export, is at least questionable. One handicap will be the limited demand for personal airplanes in the United Kingdom itself, where distances are short and the rail service is plentiful. Light plane builders in England already feel that they lack suitable engines, and are inquiring here for designs to produce under license.

Russian Data Lacking

Most reports by technicians who have visited wartime Russia indicate that volume production has been developed to a high level there. Very little is known about the actual performance of Russian airplanes. Undoubtedly, it is at least fair. But that's not important—airplane design will be in the public domain—the important thing will be know-how and aggressive salesmanship. The Russians are not export minded, but of course they could become so. Most persons presuming to be authorities on Russia say it will take the Soviets many years to produce enough durable goods for themselves.

The light plane picture has changed somewhat since it was last reported on this page. Almost everybody still thinks there will be seven-figure personal airplane annual market some time in the future. There are now about 35 makes of personal planes, ranging in price from $1,500 to $50,000. It will take about $4,000 to buy a light 4-seat model. That's too much for a mass market, but it can be brought down below $2,000 in time. Worst feature is the old one—the plane can operate only from an airport which makes its utility far too low. There are new models being announced constantly, but they are all the same in principle. It is expected that at least 100 makes of planes will be on the market when the postwar boom really gets going. Then, in time, mass production advantages and price competition will probably result in a few big companies taking over, as they did in cars.

Helicopters Show Promise

The Civil Aeronautics Board recently received from its engineers for consideration a third draft of safety regulations for helicopters and giroplanes. Discounting popular enthusiasm for rotorplanes, it is nevertheless true that many trustworthy technicians believe them to be the ultimate vehicle of private flying. The Army, somewhat without enthusiasm, is learning a great deal about direct lift by operating a sizable fleet of Sikorsky's. Maintenance is a never-ending, tiresome and expensive task. Cross-country giroplane flying is arduous. The vibration is enervating and whirling windmill overhead seems to be twisting one's neck. But 10- and 20-passenger copters will be put in taxi operation immediately after the war, to be flown by professional pilots, whom the Army will have trained. After that, it is any man's guess how soon the machines can be simplified to the point where your dim-witted brother-in-law can fly them without getting wound up in the clothes line.

Jet Engine Servicing — Less maintenance time and work is needed for a turbo jet engine than for a conventional type motor, according to Air Technical Command personnel, shown here at work on the jet of a Bell P-59A trainer. First developed in the U.S. by General Electric, these powerful engines are held in place by eleven bolts for propellerless AAF planes

North American Produced 12½% Of Total U. S. Plane Output

INGLEWOOD, CAL.—North American Aviation, Inc., produced 29,000 planes since the start of the national defense program on July 1, 1940 through September 30, 1944, or 12½ percent of the 232,000 planes of all types produced in the United States during that period. The company's production consisted of B-25 Mitchells, B-24 Liberators, P-51 Mustangs, and AT-6 Texans.

The company's annual report for 1944 reveals that after considering the possibility of entering other fields in the postwar period, the company has concluded that its "future success lies in the design and manufacture of aircraft products."

5,000 Manufacturing Plants Escape Taxes as Cooperatives

CHICAGO—Despite desperate federal need for revenue, over 5,000 manufacturing and processing plants throughout the country are bearing no share of war costs under the claimed exemption of being farmer-owned cooperatives. Many of these concerns are in the multi-million dollar class, but compete tax-free with small tax-paying businesses in such industries as farm machinery, chemical plants, dehydrating plants, canneries, flax fiber mills, wineries, and many more, according to the National Tax Equality Association.

"Tax Profiteers"

Ben C. McCabe, President of NTEA, said, "It is in the field of manufacturing that cooperatives have wandered far afield from the original intent of congress to exempt farmers, fruitgrowers, and similar associations from payment of the Federal income tax. The cooperatives are the legal tax profiteers of this war. It is their policy to charge prevailing market prices established by privately-owned competitors to include tax collected for the Federal government. A cooperative collects the tax from its customers, pays nothing to the Treasury, and distributes to its patron-owners patronage dividends that obviously include money which is collected for the U. S. government."

The NTEA report points out that cooperative groups are expanding their activities to exploit their tax-exempt status. In one case, an Ohio farm machinery plant, which previously had paid $196,000 in Federal income taxes, was taken over by a cooperative group at a price of $1,000,000, thereby becoming a non-taxpaying organization. Other similar expansions are noted with the observation that "these great cooperative corporations are piling up tax-free accumulations with which they plan to dominate the industrial scene in postwar years.

Labor Force Up 2,000, Boeing Will Only Need Replacements

SEATTLE—Since the beginning of the year, Boeing Aircraft Company has increased its payroll by 2,000, and now its manpower problem will only require replacements to offset the normal turnover of employees. Since the plant's total employment will not have to be increased, Boeing's out-of-state recruiting, which once covered 33 states, has been withdrawn to five western states.

The company will place greater dependence for new employees upon local recruiting and continued emphasis for workers staying on the job. The company has been assured of sufficient aluminum to enable it to accelerate B-29 production.

Names in the News

L. F. Campbell

L. F. Campbell has been elected vice president in charge of manufacturing of the Precision Gear Div., Foote Bros. Gear and Machine Corp., Chicago, Ill. At the same time, **R. B. Moir** was named assistant vice president in charge of sales engineering, Industrial Gear Div. and **E. A. Johnson**, assistant vice president in charge of manufacturing, Industrial Gear Div.

Recently elected officers of the Russell Manufacturing Co., Middletown, Conn., include: **Ernest R. Dayton**, vice president; **James A. Hendley**, vice president in charge of the web manufacturing division; and **Gustav Walters**, vice president in charge of the belting and automotive manufacturing divisions.

Walter H. Murphy has been named shell production manager at the Victory Yard of the Electric Boat Co., Groton, Conn. Mr. Murphy was recently superintendent of the valve division of the Parker Appliance Co., Cleveland, and prior to that he was assistant superintendent of the shell division of the National Tube Co., McKeesport, Pa.

W. R. Persons has been named assistant sales manager of the Lincoln Electric Co., Cleveland, Ohio. Mr. Persons has been with Lincoln for the past 10 years in their various sales offices.

James D. Mooney has returned to General Motors Corp. and resumed his duties as vice president, group executive of the overseas operations of the corporation, as a member of the administration committee and a member of the board, after three years as a captain in the Navy.

Robert Simkins has been named vice president of the Trundle Engineering Co., Chicago, Ill., and will be in charge of western sales with headquarters in Chicago.

Arthur L. Irwin, former assistant purchasing manager of the Consolidated Mining & Smelting Co. of Canada, Ltd., Trail, B.C. has been appointed purchasing manager to succeed **Walter R. Baxendale,** retired.

Louis Polk, president of the Sheffield Corp., Dayton, Ohio, has been awarded the Gold Medal of the Army Ordnance Association "for outstanding service to Army Ordnance." Mr. Polk has been instrumental in the development of measuring instruments and gaging system standardization with Ordnance.

Helmuth G. Braendel has been appointed chief engineer of the Wilkening Manufacturing Co., Philadelphia, Pa. For the past three years Mr. Braendel has been assistant and then chief development engineer for Continental Motors Corp., Detroit, Mich., and for seven years prior to that, he was project engineer in the Engine Development Div., Chrysler Corp.

H. G. Braendel

Don E. Miller

Don E. Miller has been appointed assistant to **John H. Prindiville, Jr.,** vice president and works manager of the LaPointe Machine Tool Co., Hudson, Mass. Mr. Miller was associated with various divisions of General Motors Corp. for some time and since the war he has worked on the conversion of such plants as the Bendix Aviation Carburetor plant, Chrysler Tank Arsenal and Packard-Rolls-Royce plant. More recently, he has been with the Houdaille-Hershey Corp., first as assistant plant manager of the Buffalo Arms plant and later as factory manager of the Garfield Div. of the same company.

George Steven has been appointed executive engineer of the Buffalo Works of the Worthington Pump and Machinery Corp. Mr. Steven was formerly chief engineer of the Buffalo Works Compressor Div. and will be succeeded by **Harold W. Whiting.**

C. W. Petersen, formerly superintendent of the subcontracting division of Sperry Gyroscope Co., Inc., has become associated with the Varick Machine & Tool Works, New York, N. Y., as works manager.

Dr. Zay Jeffries, of the General Electric Co., Pittsfield, Mass., was awarded the newly-established annual powder metallurgy medal of Stevens Institute of Technology, Hoboken, N. J., on March 7, for "outstanding work in the field of powder metallurgy."

OBITUARIES

William Baker

A. E. Robinson

William Baker, 49, vice president and director of Baker Brothers, Inc., Toledo, Ohio, passed away March 2. Mr. Baker, a lieutenant commander in the Navy, had been on active duty since 1941 and was in charge of naval procurement in the Brooklyn Navy Yard at the time of his death.

Albert E. Robinson, 79, passed away February 28. Mr. Robinson had been associated with the American Tool Works, Cincinnati, Ohio, for 61 years and progressed through various positions until he was named works manager. In 1943 he was elected vice president and a member of the board.

Byron H. Newell, 54, assistant manufacturing manager of Buick Motor Div., Flint, Mich., died suddenly March 12 at his home. Mr. Newell has been with Buick for 11 years, going to Flint after being associated with the Ford, Dodge, Oakland and Cadillac automobile companies.

Huntington Downer, manager of sales of the Basic Refractories, Inc., Cleveland, Ohio, passed away February 11.

Leo B. Jacobs, 43, died suddenly March 6. Mr. Jacobs was director of civilian personnel for the Cleveland Army Ordnance district and was previously industrial utilization consultant for the War Manpower Commission in Cleveland.

Robert H. Neill, 27, research engineer for the American Steel & Wire Co., passed away recently.

James L. Ashley, 75, a director of the International Nickel Co. of Canada, Ltd., died suddenly March 6. Mr. Ashley, who joined the original International Nickel organization when it was formed in 1902, was secretary and treasurer of the International Nickel Co. of Canada, Ltd., and vice president and treasurer of the International Nickel Co., Inc., the United States subsidiary, until his retirement in 1939.

Raymond H. Filsinger, 58, purchasing agent for Crucible Steel Co. of America died March 5. Mr. Filsinger had been associated with Crucible and its various divisions since 1906.

BUSINESS ITEMS

The **Reynolds Spring Co.,** Jackson, Mich. has purchased the stock control of the **Cleveland Wire Spring Co.,** Cleveland, Ohio. The Cleveland firm will continue as a separate organization with the same personnel and officers.

A. O. Smith Corp. has opened offices for its International Div. in the Commerce Bldg., New York, N. Y. with **A. E. Cripps,** newly-appointed Eastern supervisor, in charge.

Dresser Industries, Inc. has opened a consolidated domestic and export sales office for its member companies at 800 Chanin Bldg., New York, N. Y. Companies represented in the newly opened New York office include the Dresser Manufacturing Div., Bryant Heater Co., Clark Bros. Co., Inc., Pacific Pumps, Inc., International Derrick & Equipment Co., Roots-Connersville Blower Corp., and Stacey Bros. Gas Construction Co.

American Engineering Co. has purchased the **Cochrane Corp.,** Philadelphia, Pa. and the **Faraday Electric Corp.,** Adrian, Mich. Both companies will be operated as subsidiaries of the American Engineering Co.

Reliance Machine & Tool Corp. has opened a new and larger plant and offices at 10 Van Cortlandt Ave. East, New York 58, N. Y.

The Briggs Clarifier Co., Washington, D. C. has appointed several new industrial distributors in the west and south. Companies and their areas include: The Manning Packing & Supply Co., 65 S.W. 2nd Ave., Portland 4, Ore. for Ore. and southern Wash.; The Hendrie and Bolthoff Manufacturing and Supply Co., 1635 17th St., Denver, Col. in Wyo., Col., N. M., and western Neb.; M. F. Hampton Co., 505 McBirney Bldg., Tulsa 3, Okla. for that state; Hoffman Supply Co., P.O. Box 769, Abilene, Texas for northern Tex.; and LaGrave and Co., 812 First National Bank Annex, Mobile 6, Ala. in southern Miss., southern Ala. and northwestern Fla.

The **George Scherr Co.** has established a machine and precision exhibit at its new location, 200 Lafayette St., corner of Broome, New York 12, N. Y.

Ajax Electric Co., Inc., Philadelphia, Pa. has appointed **R. J. Benkart,** 2017 Preble Ave., Pittsburgh 12, Pa. as its representative in W. Va., western Pa. and southern Ohio.

Aro Equipment Corp., Bryan, Ohio has appointed the following ten new jobbers to handle the line of ARO industrial pneumatic tools: The Hawley Hardware Co., Bridgeport, Conn.; Continental Cutter Supply Co., Brooklyn, N. Y.; Guarantee Specialty Co., New York, N. Y.; The Sager-Spuck Supply Co., Albany, N. Y.; Utility & Industrial Supply Co., Jackson, Mich.; The Kensall Hardware-Mill Supply Co., Battle Creek, Mich.; The Lowery Co., Bay City, Mich.; Cutting Tools & Supplies, Pontiac, Mich.; The A. J. Glesener Co., San Francisco, Calif.; and the Campbell Hardware & Supply Co., Seattle, Wash.

Kellet Aircraft Corp., Upper Darby, Pa. has leased the plant of the **Philadelphia Lawn Mower Works,** Primos, Pa. to permit expansion and consolidation of its operations. Certain production shops and the Kellet experimental department will be located at Primos.

Eagle-Picher Lead Co. has acquired the production and distribution facilities of the **Southern Lead Co.,** Dallas, Texas. Personnel of the Dallas plant will be retained, but their products will be sold under the Eagle-Picher name.

Maquinaria Y Accessorios Industriales, S.A., Mexico City, Mexico, has changed its name to **Equipos Industriales, S.A.** due to the similarity of names of other concerns in the city.

The **Ford Motor Co.,** Dearborn, Mich. has purchased an industrial site for the erection of a service and parts building in Houston, Texas which will service the southern half of the state and various metropolitan areas.

Westinghouse Electric Elevator Co. has created two separate divisions to carry on the work of the company: the Air Conditioning and the Elevator Divisions. **Ross Rathbun** has been appointed manager of the Air Conditioning Div. and **Walker G. White** as manager of the Elevator Div.

Shop Equipment News

Landis Tool Co. Centerless Grinding Machine Threads Solid Screw Blanks in a Single Pass

A new principle in thread cutting is introduced in the centerless grinding machine just announced by the Landis Tool Co., Waynesboro, Pa. The machine uses a grinding wheel carrying multiple thread profiles, a regulating wheel and a work rest. It can grind accurate, smooth threads on hardened steel setscrew blanks in a single operation.

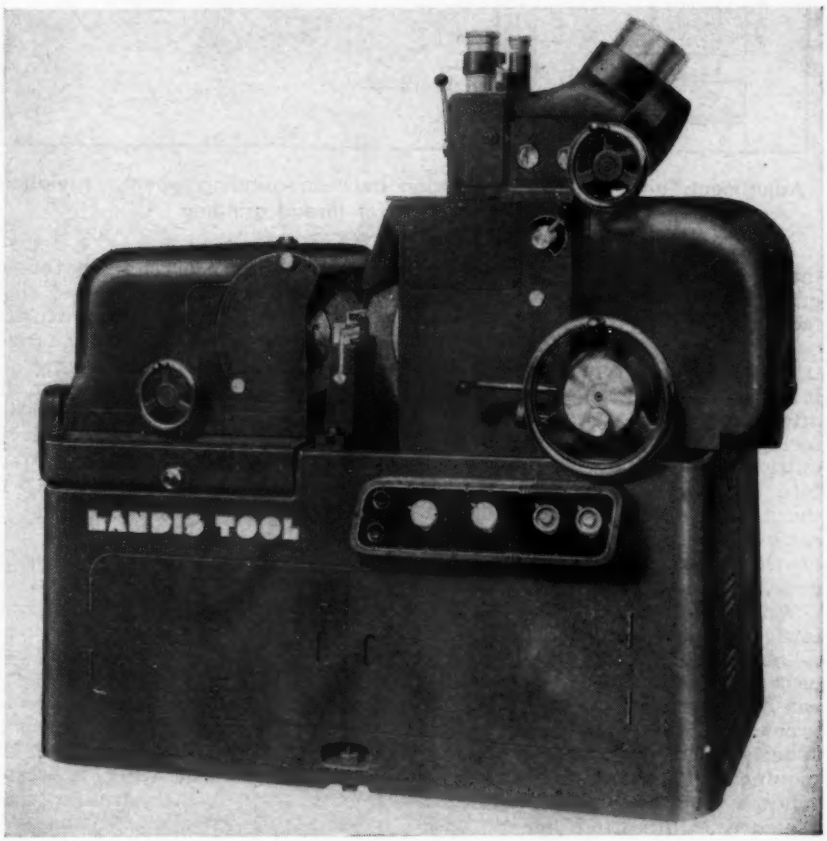
Setscrews from a No. 4 (about ⅛-in. diameter), 40 pitch, to a ⅝-in. diameter, 11 pitch, have been ground from hardened blanks, in production, in a single pass through the machine. Screws 12 in. long, ¼-in. diameter, 20 pitch, have been ground with good results; also rings almost 5 in. in diameter, with 16 pitch threads on the periphery have been handled in the Landis Tool machine.

Workpieces are fed between the grinding wheel and regulating wheel one after another as in a cylindrical centerless grinder. The feed can be by hand or by means of an automatic loader.

The grinding wheel base is moved laterally to increase or decrease the throat between the grinding wheel and the regulating wheel. Movements of the grinding wheel as small as 0.0001 in. can be made by means of a handwheel.

The regulating wheel base is universal; that is, it has linear adjustment in two directions plus angular adjustment in two planes. A swivel plate permits the regulating wheel to be tilted to provide feeding action for the screw blanks through the throat of the machine. The adjusting screw is graduated so the angle of tilt may be set to the nearest minute.

In centerless thread grinding, the top of the work rest is always set at an angle with respect to the horizonal axis of the grinding wheel spindle. Side blades move parallel to each other so the screw stock has always a constant width of throat through which to pass no matter what the slope of the work rest. The time required to change from one screw size and pitch to another is reduced by wedges ground to the proper slope for each helix angle of thread and placed under the work rest.



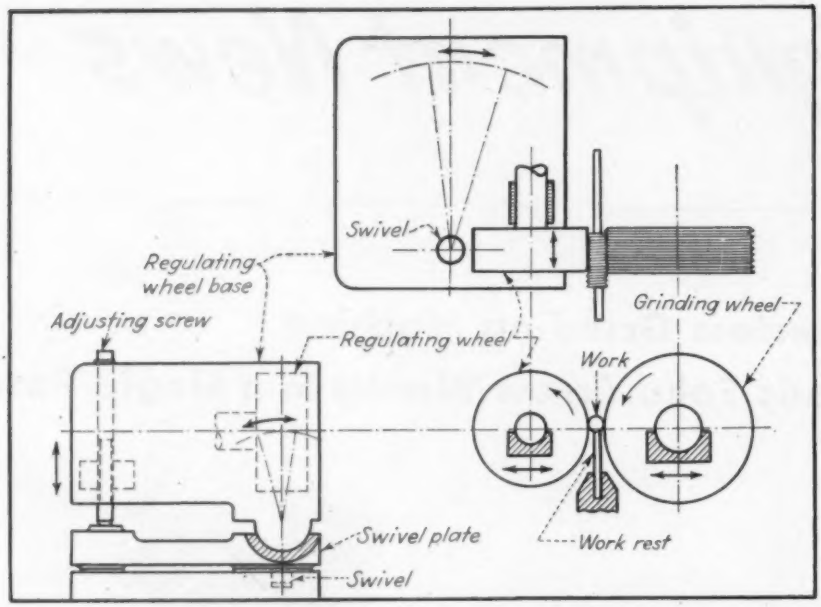
Threads are ground with a ribbed abrasive wheel in Landis Tool centerless grinder. The ribs are formed by a crushing roll mounted above the wheel

Annular grooves in the grinding wheel to form the thread profile are made by a cylindrical crusher with grooves on its periphery. The crusher is rolled against the grinding wheel with sufficient pressure to break down the bond of the abrasive, leaving the desired profile on the wheel surface.

A crusher mechanism is built into the grinding wheel base. This is in addition to a hydraulically operated diamond dresser for the grinding wheel. The crusher is driven through a worm gear reduction by a constant-speed motor. A handwheel with a graduated ring forces the crusher a definite amount against the grinding wheel face. Driving the crusher instead of the grinding wheel during the dressing operation permits regrinding to renew the form on a worn crusher and is said to result in substantial savings.

A crusher surface speed of about 150 ft. per min. on a 4-in. wide grinding wheel is satisfactory. Crusher wear is caused by the honing action of the grinding wheel grit; the higher the surface speed the more severe the honing action will be.

It takes about one minute of crushing to remove 0.001 in. from the radius of a grinding wheel. Usually an extra minute is allowed, during which the crusher is not fed against



Adjustments give the correct relation between grinding wheel, regulating wheel and work best for thread grinding

the wheel, to permit sharpening the groove form in the grinding wheel face.

The grinding wheel is diamond trued before any grooves are crushed. It is dressed for the entrance chamfer after the grooves are formed. Chamfering is done to centerless grind the outside diameter of the blanks before threading begins and to form the threads gradually. Thus metal removal is distributed across the face of the wheel and the full depth grooves remain clean and true.

Wheel life immediately following initial crushing from the solid wheel is not as long as for subsequent crushings. Only about 2,000 screws can be ground before renewal of the groove form after the first crushing. A second crushing of the wheel, removing only three or four thousandths from the radius, with less pressure, will grind about 6,000 screws before another crushing. A third crushing removing approximately the same amount from the wheel will permit a production of about 12,000 screws.

To grind screws of the desired root width, the grain size of wheels must be considered. A tentative table gives the grain sizes recommended for various pitches.

Screw Size	Pitch	Wheel grain
No. 4	40	400
5	40	400
6	32	320
8	32	320
10	28	320
12	24	320
¼	20	220
5/16	18	220
⅜	16	180
½	13	150
⅝	11	150

Soon after crushing, threads ground on the thread grinder show a root with a round bottom, which is advantageous where the fatigue strength is involved.

An auxiliary speed reduction for the regulating wheel gives a rotating speed as low as 2 r.p.m. A clutch arrangement at the rear of the regulating wheel changes the standard speed range of 12 to 96 r.p.m. to the low speed range of 2 to 16 r.p.m.

During the grinding of many screws, the threads riding on the regulating wheel tend to crush shallow grooves in its rubber-bonded surface. This action is gradual and may be corrected by moving the grinding wheel base toward the regulating wheel. When the depth of grooves in the regulating wheel becomes too great, the wheel is dressed smooth again by a hydraulic transverse movement against a diamond.

Electrical controls on the centerless thread grinder include a drum switch having five stations; set-up, grind, dress, crush and regrind. Interlocks in this switch provide safety in moving from one station to another.

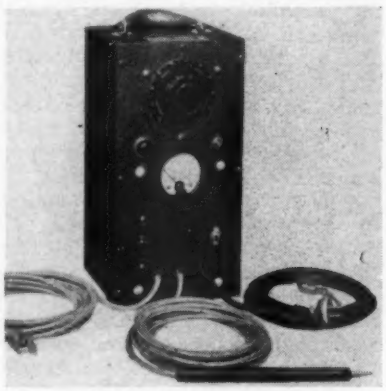
In grinding socket setscrews with cup points it does not matter which end enters the machine first. A vibration loader developed by the Landis Tool Co. automatically feeds ¼-in. diameter by ½-in. long blanks at a rate up to 85 per min. Other loaders will also give satisfactory results.

An economical rate of grinding ¼-20 screws is about 30 to 35 in. of length per minute. On this size of screw it has often been possible to operate continuously for eight hours without recrushing the wheel. During this time 12,000 to 16,000 screws ½-in. long will have been ground.

Portable Insulation Tester Has High Capacity Ratings

A portable insulation tester for operation with 110 volt, 60 cycle current to supply variable test voltages from 1 to 2,500 volts is manufactured by the General Electric Co., Schenectady, New York. The set has a rated capacity of 750 volt-amperes and will operate at one minute loads of 1,500 volt-amperes without damage.

The complete set, packed in a small steel case, consists of a dry-type transformer, a variable autotransformer for smooth voltage control, indicating voltmeter, air circuit breaker and control switches. Two 15-ft. shielded test cables, one with



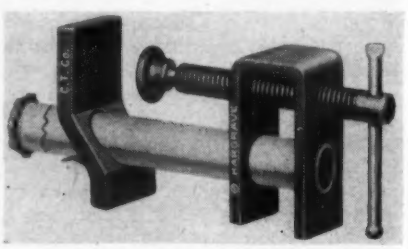
GE insulation tester

an insulated test handle and the other with a grounding clip attached, and a 15-ft. input cord are provided.

The tester gives highly accurate indications of test voltage, as the voltmeter is supplied from a separate coil on the transformer and is arranged to give full scale readings at either 2,500 or 1,250 volts. The steel case is grounded by a third conductor in the input cord and has a red signal lamp which remains lighted while the set is energized.

Cincinnati Bar Clamp Eases Weldment Holding Problems

An all-steel bar clamp fixture for holding parts when welding is made by the Cincinnati Tool Co., 4002



Cincinnati bar clamp

LODGE & SHIPLEY LATHES at work...

. . . we would be severely handicapped without our fine accurate Lodge and Shipley Toolroom Lathe

NORTON LASIER CO. LCN

Before converting to war work, Norton Lasier made the famed L. C. N. concealed and surface door closers in 86 types and sizes! To assure precision tools for the production of their wide range of closers, Norton Lasier depend on their Lodge and Shipley 14" Toolroom Lathe.

At present, this versatile Lathe produces the tools for vitally required aircraft parts. But when Norton Lasier again turns to building L. C. N. closers for the nation's fine buildings they will rely even more on their L & S Lathe. For many of the new tools this Lathe will be called upon to produce have already been designed—tools far in advance of those used before conversion.

Forward-looking firms like Norton Lasier, concerned with present-day and future tooling problems, find L & S Engineers helpful in their lathe recommendations. For detailed literature write on your company letterhead for Bulletin No. 508-BO.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

ENGINE—TOOL ROOM—AUTOMATIC—OIL COUNTRY LATHES

L & S LATHES

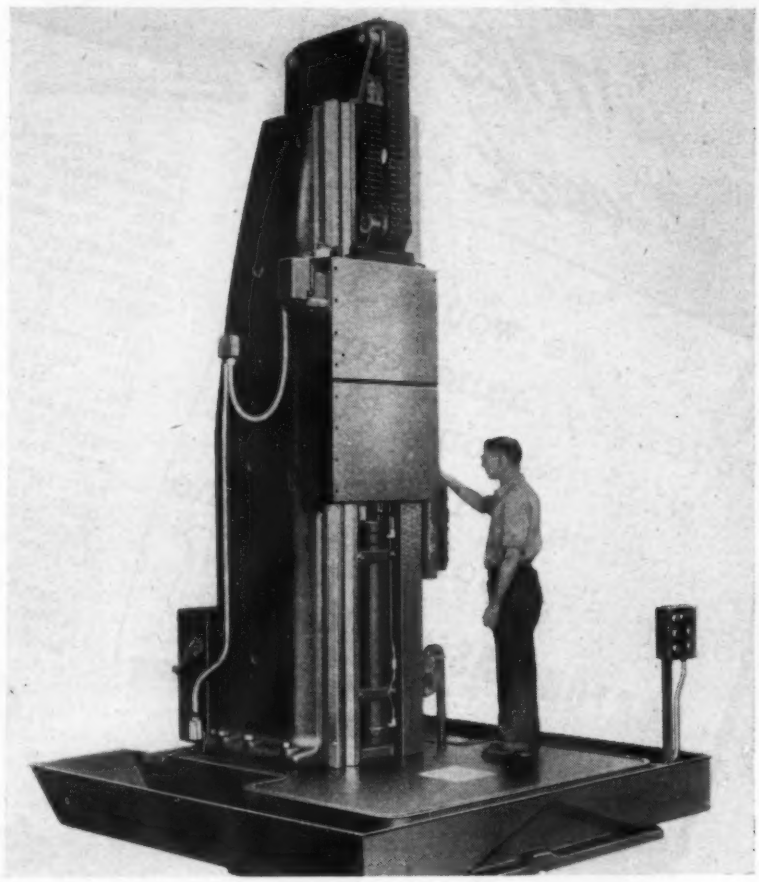
Montgomery Rd., Cincinnati 12. The use of heat-treated steel in a clamp fixture of this type permits greater clamping pressures than are possible with gray iron or malleable iron castings. The clamping surface is 1½ in. square. It fits ½ in. pipe in any length to allow any size bar clamp to be made from a small stock of pipe cut to lengths most used.

Marking Machine for Curved Parts Uses Straight-Line Type

A tangential marking machine which uses standard straight-line type or dies for marking conical or cylindrical parts is manufactured by the Acromark Co., Elizabeth 4, New Jersey. This device eliminates the necessity for special custom-built dies to mark curved surfaces. The type holder is moved across the surface along a line tangent to the curve of the part as the part rotates. This action impresses each character progressively as the type is moved across. Marking can be done with each forward and backward stroke of the operating handle. The depth of impression is controlled by an adjusting knob at the top of the marking head. When it is necessary to space markings on curved surfaces, provide calibrating lines or otherwise provide markings with a specific relationship to some physical feature of the part, the type holder and work holding fixture can be geared together in such manner that the peripheral advance of the part is equal to the linear advance of the type. The depth control slide and marking head are provided with adjustments for wear and misalignment of type and parts.

Acromark tangential marker

Barnes Vertical Drilling, Boring Machine Adapts to Many Uses



Barnes 924 vertical machine

The 924 vertical drilling, boring and facing machine is especially suitable for high production jobs requiring wide-area heads. This basic machine may be equipped by the manufacturer, W. F. and John Barnes Co., 301 South Water St., Rockford, Illinois, with multiple spindle heads, indexing table arrangements, multiple columns and other arrangements.

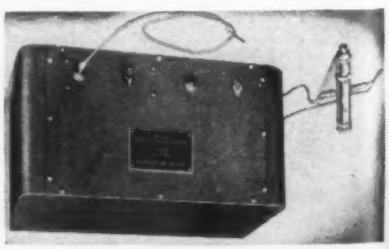
The base of the standard machine has a clear front area 48 in. deep and 72 in. wide. A chip and coolant tray extends across the front and both sides of the base. The standard column is a heavy cored casting with a mounted height of 172 in. overall. The accurately finished ways span 24 in. to mount the head saddle. The hydraulic unit for actuating the feed cylinder is mounted on the side of the column, as is the coolant pump. Encased in the column is the feed cylinder, which may be of 5½ in., 7½ in., or 8 in. diameter. Also placed inside the column is the counterweight shell and weight plates which may be adjusted to give a total counterweight of 4,000 to 10,000 lb. to balance the saddle and head.

The saddle face has a surface of 50 in. × 29½ in. for attaching the necessary heads. The maximum stroke of the saddle is 36 in. with a minimum clear height of 18 in. to 41 in.

Special bases and extra height columns are made to order for many types of operations requiring up to 60 hp. with 50,000 lb. thrust.

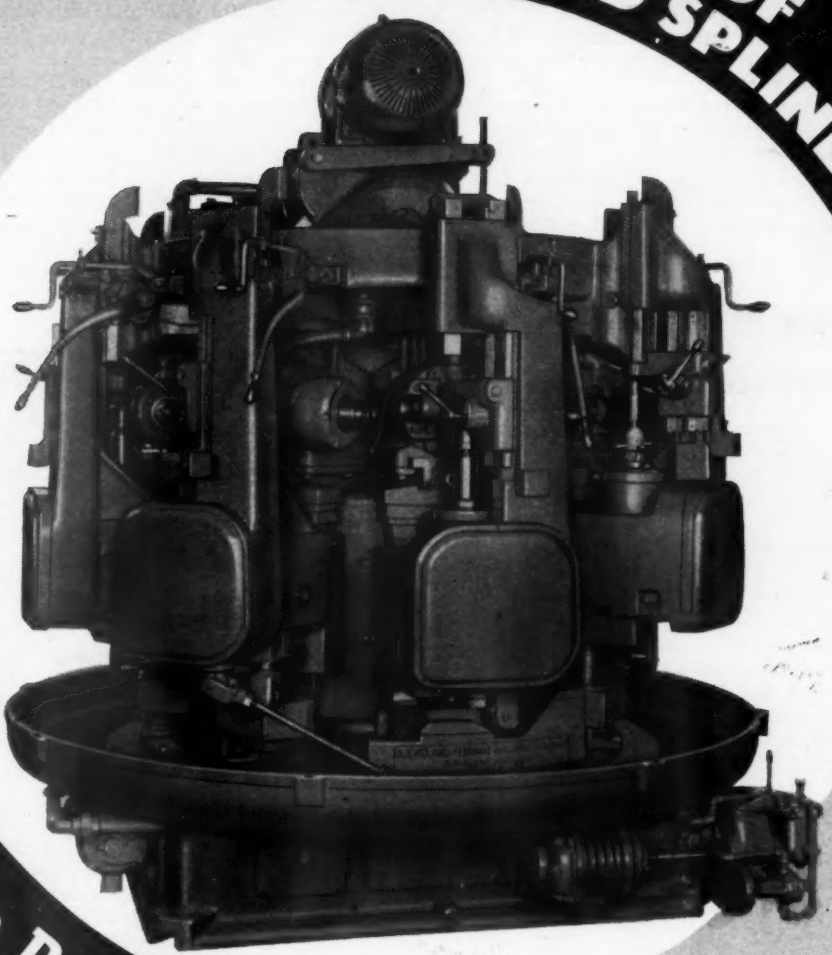
High-Speed Indicator Plots Time-Pressure Cycles of Gases

The Pressuregraph, manufactured by the Electro Products Laboratories, 549 West Randolph St., Chicago 6, gives instantaneous linear indications



Pressuregraph indicator

FOR THE HIGH PRODUCTION OF PRECISION GEARS AND SPLINES



The Rotary RIGIDHOBBER

THIS BOOKLET

tells about hobbing—the simplicity of the Rigidhobber—its advantages from standpoint of duplicate accuracy—speed and production costs. Write for your copy today.

EXCEPTIONALLY HIGH PRODUCTION

is obtained because of design which permits eight operations to be performed simultaneously—eight finished pieces to be turned out at every cycle. Operations on each of the 8 spindles are performed independently of each other during continuous rotation of the 8 spindles on the machine base.

The Rotary Rigidhobber also offers unusual operating flexibility. Different hobbing operations on gears and splined shafts can be performed simultaneously at each station.

SIMPLE TO OPERATE

The operator merely loads and unloads the work at the loading position—all machine functions are fully automatic.

Rigidity makes for accuracy. Work is supported both above and below hob during operation—this insures close accuracy and absolute duplication. Machine will handle work up to 6" diameter and 13" long.

Consult a Cleveland Hobbing Engineer on your precision gear and spline hobbing.

The CLEVELAND HOBBING MACHINE Company

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS

of pressure-time curves on the viewing screen of a cathode ray oscillograph. The device can be used to measure either static or dynamic pressures of any steam or internal combustion engine, pump or any other inclosed pressure system.

Instantaneous response of the electronic circuits permits indication of the curves of devices with pressure-time cycles as complex as those of both crankcase and main cylinders of high-speed 2-cycle engines.

In operation, the pressure pickup is inserted in the chamber to be indicated. The pickup response is transmitted, after amplification, to the screen of a cathode ray oscillograph. Only one control is required after one initial adjustment has been made to compensate for variable temperature effects.

The unit is rigidly constructed to withstand reasonably rough treatment and permit it to be used as a portable instrument.

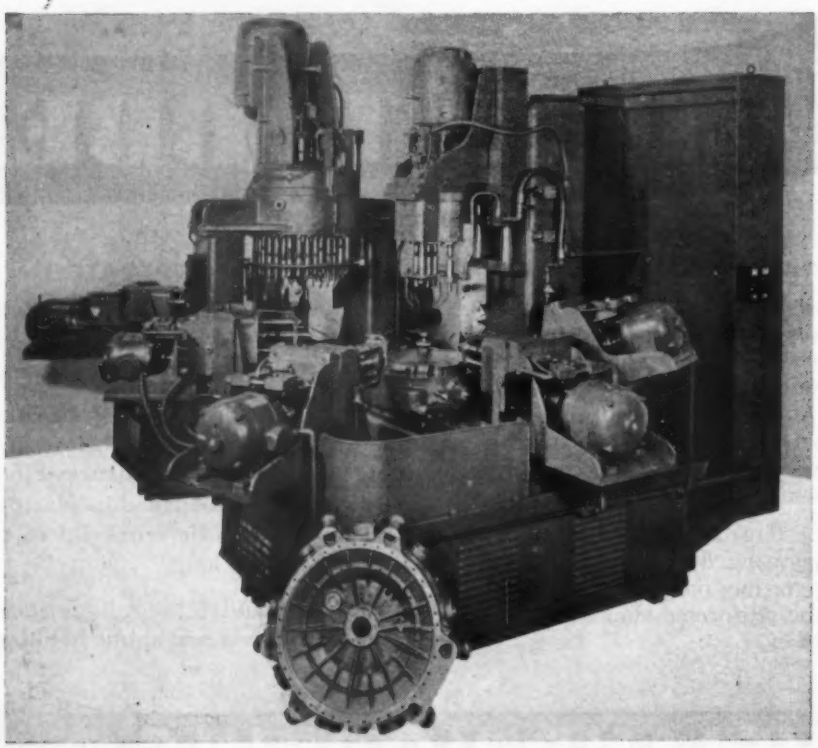
Two-Station Multiple Machine Automatically Taps Large Housings

An automatic cycle machine for tapping bolt holes in large housings is manufactured by Snyder Tool & Engineering Co., 3400 E. Lafayette, Detroit 7.

With the part located and clamped in central position on the fixture slide, the starting button sends the slide and part to the left of the operator and under a multiple-spindle tapping head. In the same position are several horizontal and angular units with tapping spindles. All the tapping spindles have individual lead screws. When the left half of the machine has completed its cycle the part is moved automatically past the central loading station to the right where another group of vertical, horizontal and angular tapping spindles go through their operating cycle.

A number of these units are mounted on hydraulically operated subslides to provide rapid advance of the entire unit before lead screw tapping. The vertical head in the left-hand station has a large group of spindles on the periphery which has no hydraulic advance. The cluster of spindles in the center of the head are automatically advanced into tapping position several inches lower than the outer spindles.

The machine is equipped with a master control pushbutton station near the loading position. For set-up purposes only, there is a control station at each tapping unit. Tapping compound is contained in a compartment at the rear of the machine. The base of the machine is of welded steel construction.



Snyder multiple tapper

Carbide-Tipped Size Blocks Supplement Precision Equipment

Round size blocks designed for use on the shop floor and on production lines are manufactured by Yankee Precision Products Co., 965 Farmington Ave., West Hartford 7, Conn. They are intended to supplement the use of precision gage blocks.

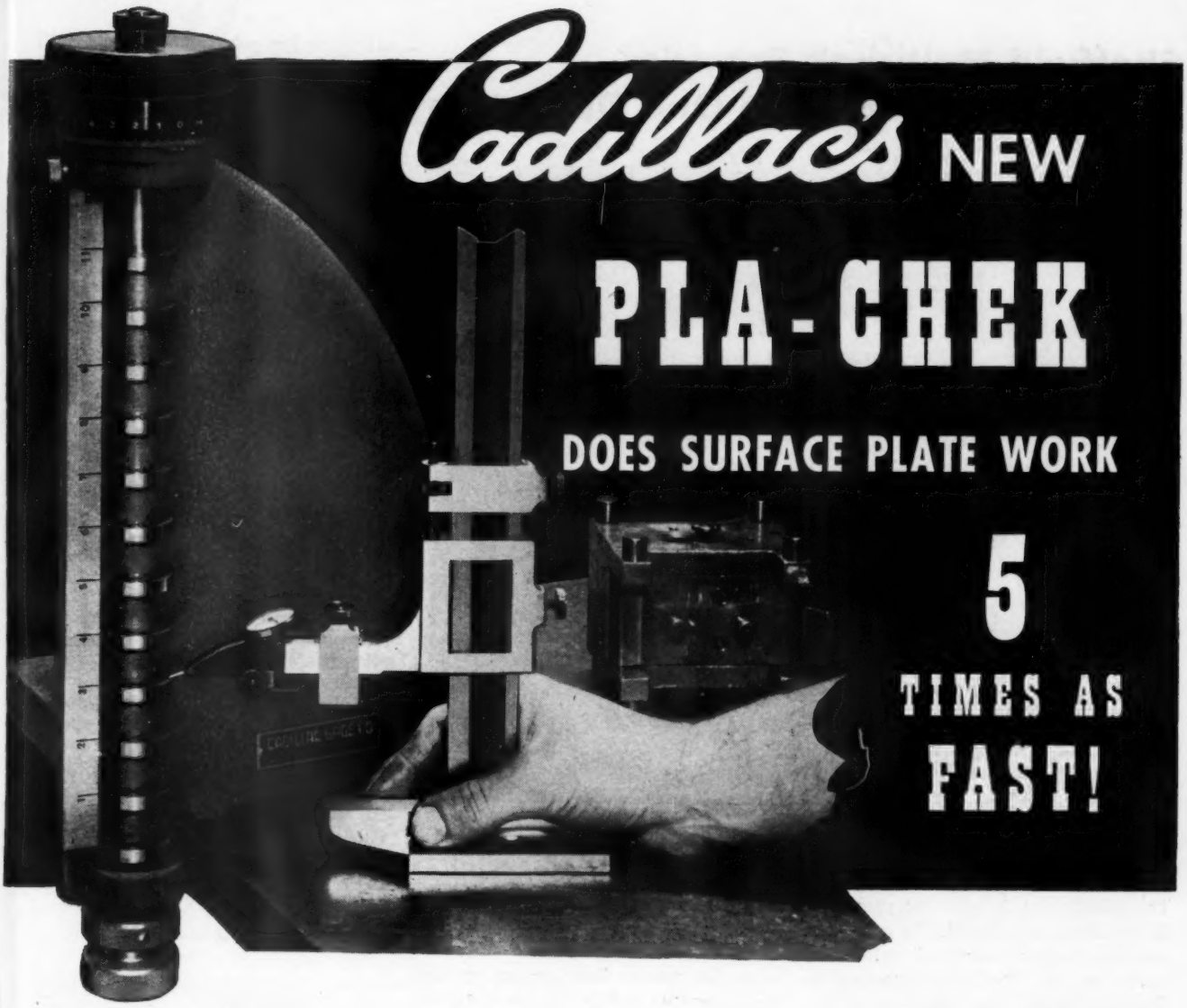
Handi-Blox are made in gaging sizes from ¼ in. to 4 in. and are made of solid carbide in the smaller sizes and carbide tipped in the larger sizes. The specified dimension of each block is held to a tolerance of 0.0001 in. The use of carbide for gaging surfaces extends the useful life of the block many times that of steel blocks under ordinary shop conditions. This permits a closer dimensional control of shop operations without subjecting precision gage blocks to rough handling conditions.

Handi-Blox

CMD helical groove center

Cobalt-Tungsten Alloy Tips Torch Welded to CMD Centers

CMD helical groove centers with cobalt-tungsten alloy tips assure "red hardness" on even the most difficult cutting operations. The abrasion-resistant cobalt-tungsten alloy is torch welded onto the center tip, midway from the point. Torch welding fuses the "red harness" alloy with the steel base of the center and assures rigidity and long service. The Chicago Manufacturing & Distributing Company, 1928 West 46th Street, Chicago, Illinois, manufactures the CMD centers.



WITH Cadillac's new Pla-Chek you can get out five times as much surface plate inspection work as you do now—and it will be accurate because Pla-Chek is guaranteed accurate to .00005″.

Pla-Chek is a hardened steel bar with 12 steps spaced exactly 1″ apart; a micrometer screw thread ground on the lower end; a large micrometer thimble graduated in .0001″ on the upper end of the bar and a simple triangular-shaped support bracket.

With this bracket set on a conventional surface plate and the micrometer thimble set at zero, the lower end of the bar is exactly level with the surface plate.

The micrometer is then set for the desired dimension in thousandths and tenths of thousandths and the measurement is taken from the desired inch step. Measurements are guaranteed accurate to .00005″ for any size from .001″ to 12″ from the surface of the plate.

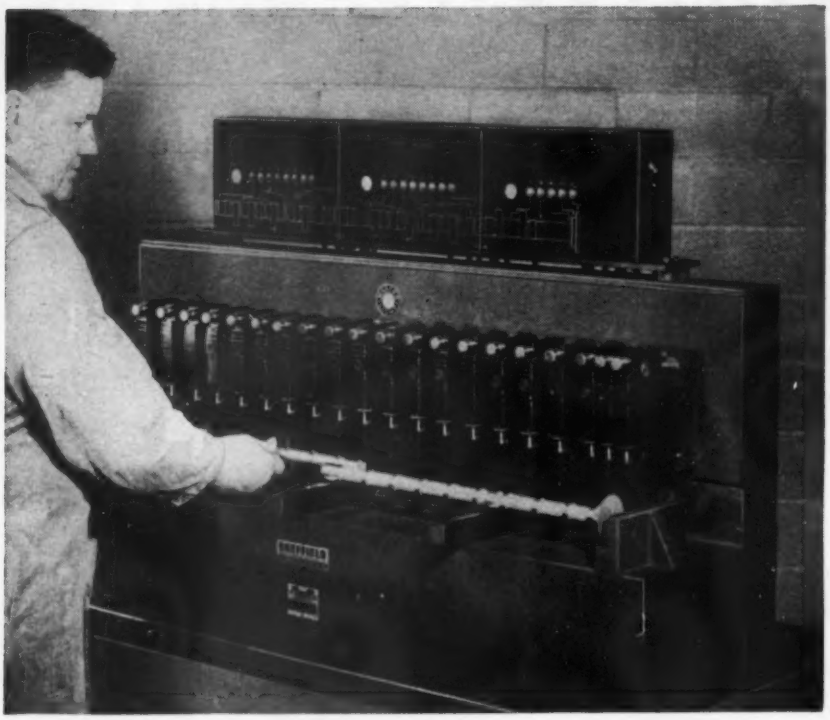
TWO WEEKS FREE TRIAL

So that your inspectors can see how much time Pla-Chek will save them, we will send it on two weeks free trial. If this trial satisfies you, send your check, if not, return Pla-Chek express collect and you owe us nothing.

Cadillac GAGE COMPANY

20316 HOOVER ROAD • DETROIT 5, MICHIGAN

Sheffield Multichek Provides Complete Gaging in One Operation



Sheffield Multichek

The Multichek is built of standard Electrichek gage heads, to meet inspection requirements of individual parts, by the Sheffield Corporation, Dayton, Ohio. The number of dimensions to be checked may vary from two to more than twenty, depending upon the design of the piece to be checked. Once the instrument has been properly set up, the manual operations involved in checking parts are reduced to loading and unloading parts.

Each of the dimensions is indicated on a diagram panel by means of light signals and all are checked simultaneously in one operation. In one application, thirteen dimensions have tolerances of 0.0005 in., six have 0.010 in., and two have 0.001 in.

Each of the Electrichek gage heads actuates a set of two individual signal lamps mounted behind a common port in the light case. Lights remain off when the dimension is within tolerance limits. When a light bulb shows red, it indicates that the dimension is under the minimum tolerance limit, while a green light signifies the dimension is larger than the maximum.

The operator needs to watch only one master light which remains off when all the dimensions of the part being checked are within tolerance limits. If any one or more dimensions are either undersize or oversize, the master light comes on and the operator refers to the diagram panel to see which signal light shows red or green to indicate the error.

Plastic Housings for Thor Drills Reduce Their Weight

A portable electric drill with gear case, field case and handle molded in "Thorite" plastic is 20 percent lighter than comparably rated drills with aluminum casings. All internal operating parts of the Thor drill are supported in a metal frame entirely independent of the plastic housings; the drill is complete and will operate with all housings removed. The drill is manufactured to operate at speeds of 2,500, 3,750 and 5,000 r.p.m. by the Independent Pneumatic Tool Co., 600 West Jackson Blvd., Chicago 6. The over-all length is 7 9/16 in. and gross weight 3½ lb.

Thor drill

Schauer Polishing Lathe Features Single Speed Control

An air-operated, variable-speed, heavy-duty polishing lathe manufactured by the Schauer Machine Co., 2600 Reading R. I., Cincinnati 2, is controlled by a single foot pedal. Depressing the foot pedal closes the collet, releases the spindle brake and connects the continuously operating motor to the work spindle through a Twin Disc clutch. Releasing this foot pedal disengages the clutch, applies the spindle brake and releases the time lag valve to open the collet. Collets up to 1⅜ in. can be used as well as step chucks, expanding mandrels or special holding fixtures.

Spindle speeds are changed by a built-in Reeves transmission with an outside control crank to provide a range of 100 to 4,800 r.p.m. It is furnished with an 1,800 or 3,600 r.p.m., 220/440 or 550 volts-3 phase 50/60 cycle motor.

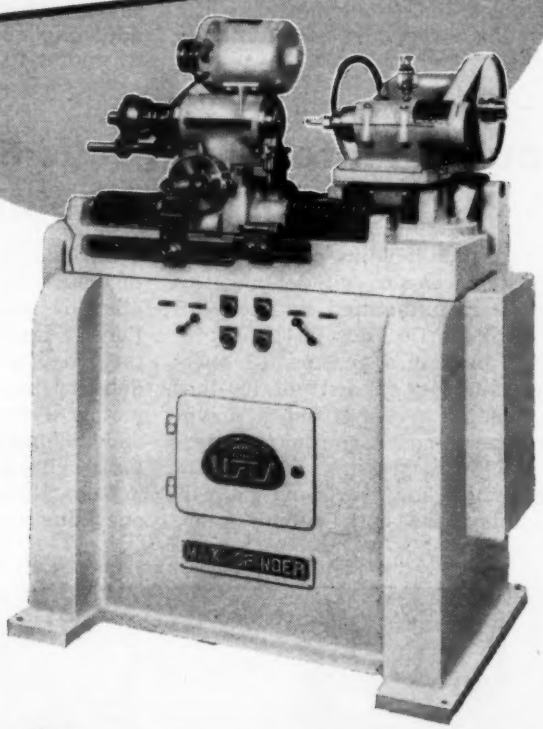
Lo-Hed car puller

Lo-Hed "One Man Gang" Powers Car Spotting and Heavy Jobs

The American Engineering Co. of Philadelphia manufactures the class 2½ Lo-Hed car puller with a draw of 5,000 lb. The gear box, motor and barrel are assembled as a unit for mounting to a suitable base by means of four bolts. It is intended for spotting freight cars, pulling skids and other movement of heavy loads.

Here is An Innovation In INTERNAL GRINDER DESIGN *that offers*

WIDER RANGE
SIMPLICITY OF OPERATION
SPEED and PRECISION



Choose the Maxi-GRINDER for ultra-finish and extreme accuracy on *any* internal grinding operation. The features listed below qualify this unit for your toughest jobs.

Convenient grouping of controls leaves operators right hand free for loading and unloading work head.

Entirely automatic collet opening and closing.

Mechanical differential unit drives grinding-spindle carrier —eliminates bell-mouth holes.

Easily adjusted stroke length adapts unit to shoulder and blind hole grinding.

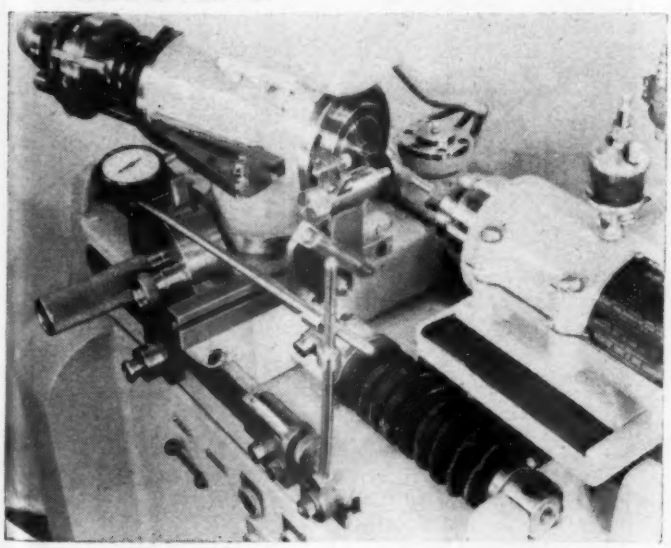
Six spindle speeds, can be slowed quickly for wheel dressing.

Micrometer feed on diamond wheel dresser quickly adjusted.

Totally enclosed feeding mechanism is free of backlash, protected from dust.

Built in sine bar simplifies taper and angular hole grinding.

Separate motors provided for each operation. Push buttons control all functions.



Wilson MACHINE PRODUCTS CO.
1231 Beaufait Ave.
DETROIT 7, MICH.

WILSON MACHINE PRODUCTS DETROIT MP

Order your copy of the new *Maxi-GRINDER* Catalog . . . no obligation

Please send the new Maxi-Grinder Catalog to me at once.

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Electronic Gage Indicates Roughness of Coarse Surfaces

The type CP roughness meter manufactured by the Physicists Research Co., 343 S. Main St., Ann Arbor, Mich., gages surface finishes of extremely coarse surfaces on such objects as turned shells. The operation of the electronic device is similar to that of the Profilometer, manufactured by the same company for the purpose of gaging variations in relatively smooth surfaces.

Readings of the roughness meter are directly in microinches of the surface being measured. The meter and scale selector provide full scale ranges of 300, 1,000 and 3,000 microinches of indicated surface variation.

In appearance the roughness meter resembles the Profilometer and in operating principle is essentially similar.

CP roughness meter

The tracer is designed for hand operation and is ruggedly built for use on rough surfaces. It is heavier than the Profilometer tracer and has a blunt diamond point for tracing the surface. The diamond point is self-adjusting to any curvature from ¾ in. radius to a flat surface.

Double-Platen Hydraulic Press Has 100-Ton Molding Pressure

An hydraulic molding press containing a top transfer cylinder and two rams is manufactured by the Watson-Stillman Co., Roselle, N. J.

This press has an upward operating ram with capacity of 100 tons for general molding and a downward operating 30-ton ram for transfer molding at pressures of 6-30 tons. The "stop" and "up" and "down" operations for both cylinders are controlled by conveniently located pushbuttons. The pressure is supplied by two pumps—one for maintaining pressure on the main ram, the other a high-and-low variable-delivery pump, driven by a 7½ hp. motor. There are separate pressure and inching handwheel controls for both cylinders, controlled by pushbuttons through solenoid-controlled operating valves.

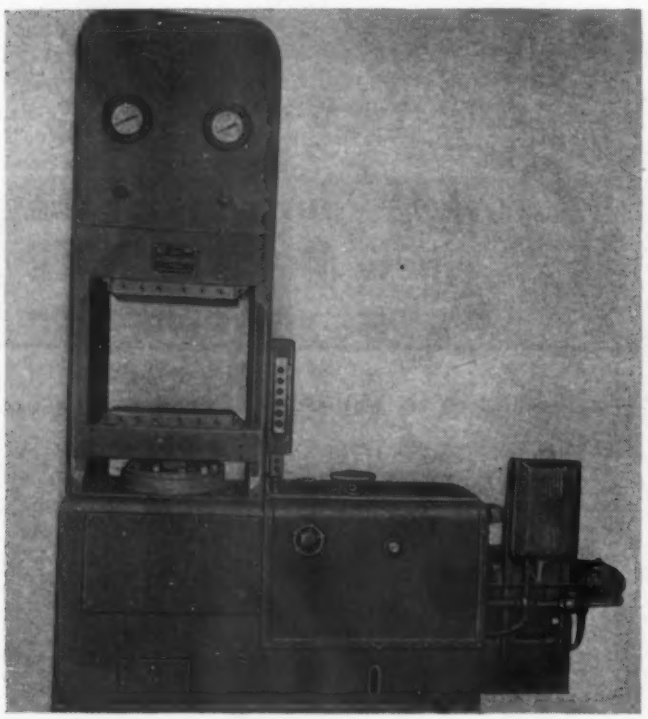
The press has an operating speed for the main ram of 58 in. per min. advance; 23 in. per min. pressing; and 85 in. per min. return. Diameter of the main cylinder is 11½ in. and diameter of the main ram is 10-¾ in. Diameter of the top cylinder is 6¼ in. and diameter of the top ram 2¼ in. Platens measure 20 ×20 in.

This press is 9 ft. 8½ in. in height and occupies a floor space 5 ft. by 8 ft. 6 in. It weighs 8,000 lb.

Induction Heater Without Radio-Frequency Transformer

An electronic induction heater for brazing, soldering, annealing, hardening and preforge heating applications has been developed by the Allis-Chalmers Manufacturing Co., Milwaukee, Wisconsin.

With a low-loss coupling arrangement, the Allis-Chalmers electronic generator can be adapted to a wide variety of metal-working applications without the use of radio-frequency transformers. Predetermined automatic timing controls each unit operation, assuring uniform production quality. The operator pushes the start button, and when the operation is completed, the unit automatically shuts off. Other features of the a.c. electronic heater inculde a current limiting circuit for protecting the oscillator filament and prolonging tube life; a three-phase rectifier on larger size units to ob-



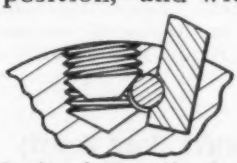
Watson-Stillman 100-ton press

Allis-Chalmers induction heater

McCROSKY Super Adjustable REAMERS

Cut Costs On and Off the Job

Positioning of McCrosky's service proved pin and screw locking device in front of the blade, enables the screw lock to work with, rather than against the cutting thrust,—thus holding the blade securely in the slot, even when in fully extended position,—and without restricting the clearance for chips and lubricant.



Sectional View Showing Bearing Screw and Pin That Hold the Blade Rigidly Against the Reamer Body.

Blades can be released easily, and adjusted uniformly and accurately. This permits them to be reground with a minimum loss of stock, and the reamer returned promptly to service, reducing to a minimum the number of tools required to keep a job in continuous production.

McCrosky reamers are furnished with straight or taper shanks, or in shell design with straight or tapered holes for mounting on hardened arbors. Sizes up to 6" in diameter with High-Speed blades. Larger sizes, or reamers with cobalt, cast alloy or carbide tipped blades on special order. Send for Bulletin 16-A. Gives full details.

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS
Block Type BORING BARS
Wizard CHUCKS AND COLLETS
Super Adjustable REAMERS
Turret TOOL POSTS

tain maximum power and prevent unbalance of the power line; safety devices for full protection of operator and unit.

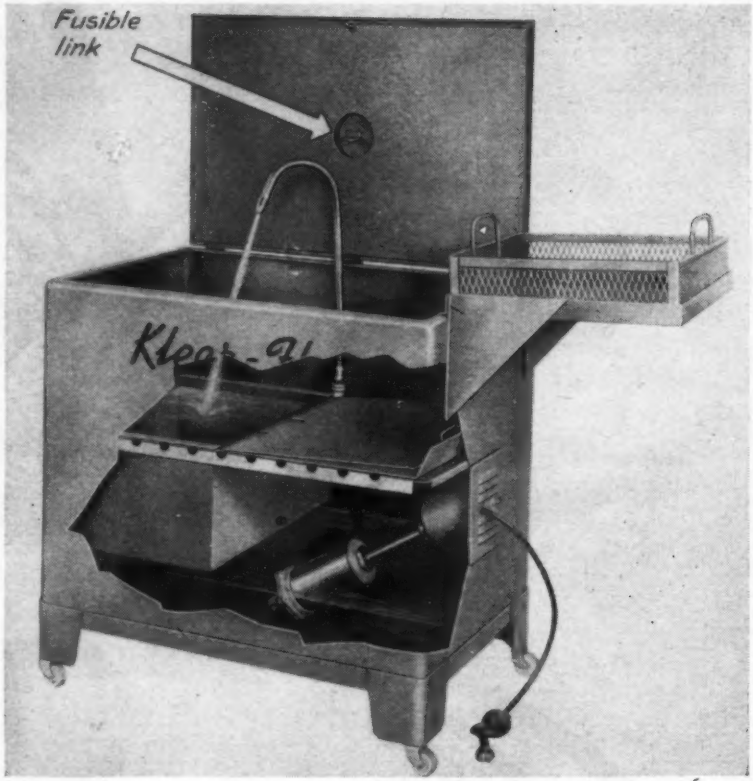
All models having a capacity of 10 or more kilowatts operate from either 220 or 440 volts.

Sump Tank Cleaning Machine Reclaims Heavy Sludge Oil

A sump tank cleaner with a centrifugal filter basket to enable high-speed separation of clean oil from sludge, dirt and chips is manufactured by W. R. Carnes Co., Madison 4, Wis. The sludge basket rotates at 700 r.p.m. and forces the oil through dense filter bags which retain all foreign material. The basket need only be emptied when 70 to 100 lbs. of chips and other retained material has accumulated.

The machine is equipped with a precision rotary vacuum pump driven by a ½ hp. motor which creates a high vacuum in the storage and centrifuge tanks. This vacuum creates a suction in the hose that is placed in the sump tank and pulls all the sludge, chips and oil into the sludge basket. The centrifuge drives the clean oil through the filter bags and retains the sludge and chips in the bag. The vacuum then draws the oil over to the storage tank. When the tank becomes full, a float control activates vacuum controls which stop the pump unit. At the same time, a pilot light indicates the tank to be full. The sludge basket is removed to empty and the tank is drained through a drain in the bottom. As nothing but air passes through the pump itself, all excessive wear and clogging are eliminated.

The machine has a pumping capacity of 25 gal. per min. and a storage tank capacity of either 100 or 150 gals. The same machine is also made in a continuous discharge type.



Kleer-Flo cleaner

Carnes tank cleaner

Mechanical Parts Cleaner for Use With Inflammable Solvent

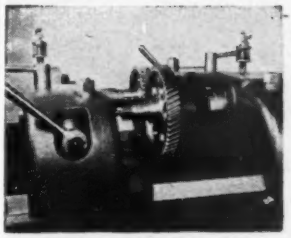
The model 30 Kleer-Flo parts cleaner is equipped with a 160 deg. F. fusible link to automatically close the hinged cover and snuff out fire. The machine cabinet is electrically welded of 20 gage cold-rolled sheet by the Practical Products Co., 2632 Nicollet Ave., Minneapolis 8, Minn. The working compartment has a 12 in. depth and sliding shelves over the 10-gal. soaking tank. The base reservoir capacity is 20 gals.

It is equipped with a 110 or 220 volt, 50 or 60 cycle sparkless motor especially designed for safe operation in explosive vapors. Floor space required is 24 in. by 36 in.

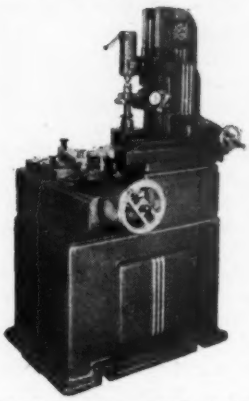
Protective Hood Resists Concentrated Inorganic Acids

An acid hood which gives chemical workers protection against all concentrations of nitric, sulfuric, hydrochloric, acetic hydroflouric and carbolic acids has been developed by the Chicago Eye Shield Co., 2300 Warren Blvd., Chicago 12.

Inorganic and also a large number of organic acids have no deteriorating effect on the hood which is made of Cesco Acitex especially developed for the purpose. The hood covers the head, chest and back.



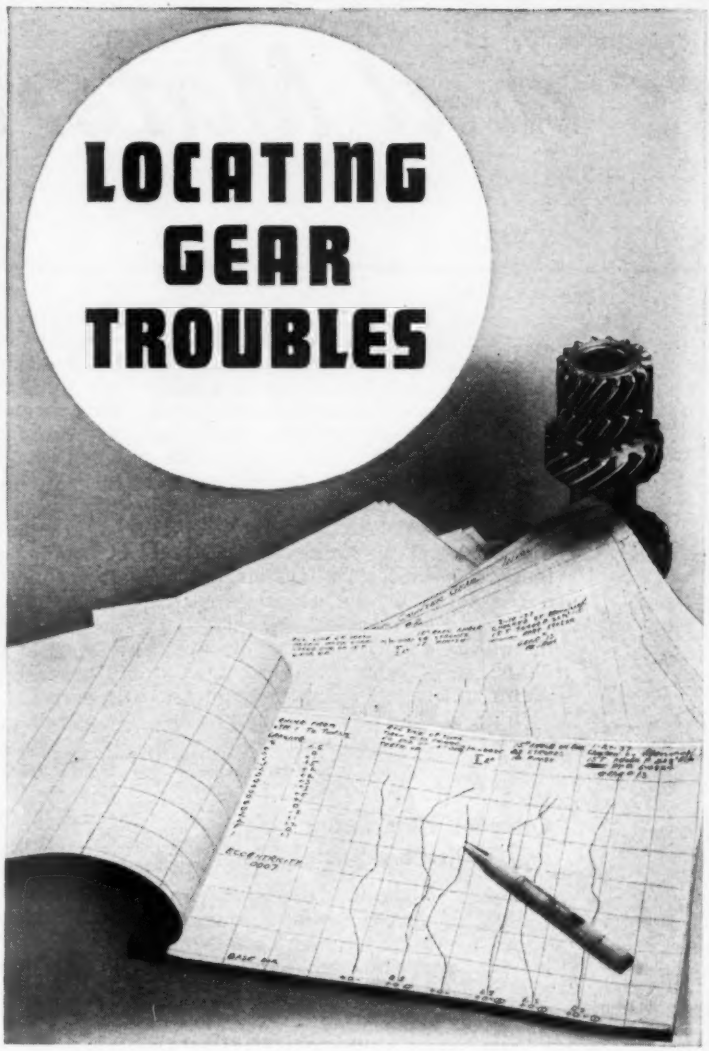
MICHIGAN GEAR SPEEDERS are available in two types for quick checking for quietness and bearing. Ask for information on Model 1127-B (for gears up to 9½") or 1129 (for gears up to 13").



MICHIGAN SINE-LINE INVOLUTE CHECKER provides rapid check of gears without necessity of additional base rolls, etc. Ask for information on Model 1124 (for gears up to 12" O. D.) or Model 1124-C (for gears up to 20").

MICHIGAN SINE-LINE LEAD CHECKERS will check left or right hand helical gear leads from zero to infinity without necessity of additional master rolls, discs or lead screws. Ask for information on Model 1205-18 (for gears up to 18") or 1205-24 (for gears up to 24").

MICHIGAN BASE PITCH AND SPACING CHECKER recently added to the Michigan SINE-LINE. Ask for information on Model #1130.



GOOD gears are not a matter of accident. They are the result of selecting the right kinds of steels, sticking to accurate production methods and equipment, proper heat-treating and adjusting for heat treat distortion.

To produce good gears *consistently*, good checking equipment is a "must". That is why Michigan SINE-LINE equipment includes machines to check and analyze not only gears but also gear cutting tools with laboratory precision *in the shop.*

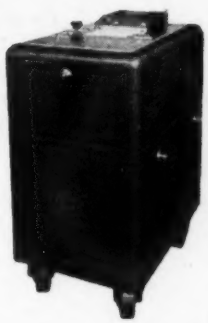
Michigan Tool Company—Gear Production Headquarters—field engineers will be glad to help you on your gear problems and advise you as to the type of Michigan SINE-LINE equipment best suited to your specific needs.

MICHIGAN TOOL COMPANY

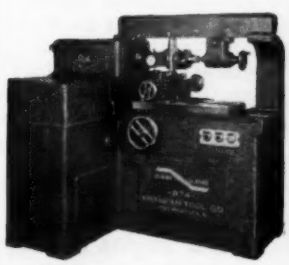
7171 E. McNICHOLS RD. DETROIT 12, U.S.A.

SINE-LINE HOB CONTOUR CHECKERS permit quick checking of pressure angles of hobs on a simple fixture. Ask for information on Model #464.

MICHIGAN HOB-SHARPENING CHECKER incorporates complete facilities for checking correct resharpening of hobs, milling cutters and form cutters. Ask for information on Model #471.

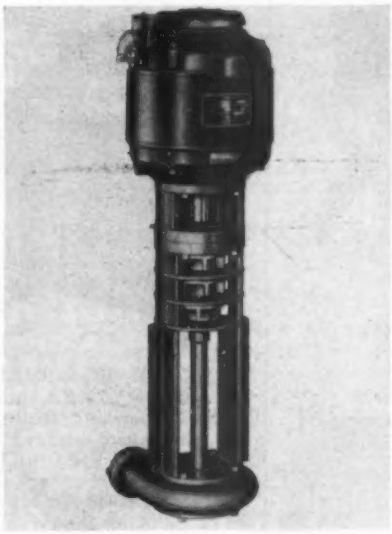


MICHIGAN AUTOMATIC CHECKING RECORDER can be coupled to SINE-LINE involute, lead, or spacing checkers. Makes permanent chart records. Can be used for other purposes than gear checking, too. Ask for information on Model AY-1.



SINE-LINE LEAD AND LINE OF ACTION CHECKER for Hobs. Checks deviations from true lead to ten-thousandths of an inch. Line of action sine-bar also permits checking of active profile. Ask for data on Model #874.

Parts and Materials



Gusher metal pump

Gusher Molten Metal Pump Handles 1,000 Deg. Metals

A flow of 1,500 lbs. of molten metal per min. at a six-foot head is supplied by the Gusher pump manufactured by the Ruthman Machinery Co., Cincinnati 2. Material flow can be controlled by means of a throttle at the point of delivery to vary the discharge rate from zero to full capacity.

The drive motor is a full ball-bearing type and is completely water jacketed on the pumps designed for use at high temperatures. Motors driving pumps used at 750 deg. F. or less are air-cooled. The maximum immersion depth is 10 in. and the recommended depth for continuous operation is 4 in. The pump and motor assemblies are equipped with guide bars to facilitate removal when not in use. The pump is a non-clogging open type especially designed for use at high operating temperatures.

Diesel Engine Fuel System For Gas, Oil or Combination

Engines capable of instantaneous conversion from oil to gas or a combination of both fuels, without change in load or speed, are manufactured by the Worthington Pump and Machinery Corp., Harrison, N. J. The conversion or combination of fuels is accomplished by manipulation of a single fuel control wheel. The engine operates on the diesel cycle when burning either fuels or combinations of fuel. The Worthington unit does not require a high pressure gas supply; a pressure of 2 in. of water is used. When operating as a gas fuel engine, pilot oil ignition is used. The system is produced to cover the entire range of Worthington diesels. Although its flexibility permits its use in many fields, it is best suited to sewage plants, oil fields, industrial and municipal gas plants and operations producing gas as a byproduct.

Compact Time Delay Relay With Cam Switch Mechanism

A small size motor operated timer for d.c. or a.c. operation is manufactured by R. W. Cramer Co., Centerbrook, Conn. The over-all dimensions are approximately 2 9/16 in. wide by 3 13/16 in. long by 3 3/16 in. high. The maximum time ranges are from 25 sec. to 10 min. The minimum settings are 1¼ sec. to 30 sec.

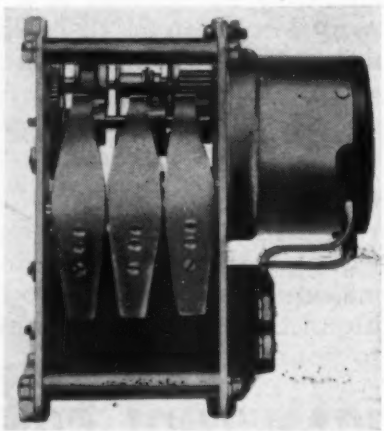
A compact frame of duraluminum with brass bearing inserts serves as a mounting structure for the complete mechanism. Four spacers insure parallel spacing of time plates to avoid friction in bearings due to torsional stresses.

The motor output shaft is connected to the cam operating mechanism by a small universal joint and a magnetically operated gear clutch. This mechanism rotates the cams to operate the switches. When the timer is de-energized, a return spring resets the cams to starting position.

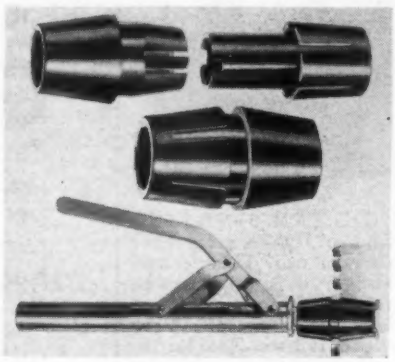
The switch units are fully inclosed single-pole double-throw with double make and break contacts rated at 10 amp. with either 24 volt d.c. or 110 volt a.c. One switch unit is used to provide an independent load circuit, the other is used for the motor control and is set to cut out the motor circuit at the end of shaft travel.

The motor is a permanent magnet-type consisting of 7 coils and 7 commutator segments to provide positive starting. A solid aluminum cup extends into the air gap and creates eddy currents; this provides an electrical loading of the motor which results in uniform torque and speed characteristics. These motors are available for operation with d.c. 6 to 30 volt currents.

Motors for 110 or 220 volt, 50 or 60 cycles are also supplied.



Cramer timer



Des-Grommets and assembly tool

Plastic Grommet Installed With Blind Fastening Tool

For protection of cables and lines passing through bulkheads of ships and aircraft and for applications requiring electrical insulation through metal panels, the Victory Manufacturing Co., 1105 So. Fair Oaks Ave., So. Pasadena. Calif., produces a non-inflammable grommet.

The "Des-Grommet" is composed of two parts molded from a special non-inflammable formula of Luma-

THIS picture shows copper being rolled by Revere. It comes from between the final rolls in a glistening sheet, true to gauge, and is delivered in the correct temper as specified, cut to accurate dimensions. We have been rolling copper for 144 years, and being the oldest metal-working firm in the country, know how to do it right.

Today, Revere sheet copper goes to war. It is a vital metal, available from Revere or its distributors only on authorized C.M.P. orders.

Some day, and we hope soon, it will go to you again for civilian metal work, for such things as roofing, flashing, gutters and downspouts, tanks, ducts, and all the thousand and one things for which copper is preferred because it is so easily cut, formed, riveted, soldered. In most applications it is so long-lasting as to be permanent.

When the day of reconversion comes, Revere will have no problems in its copper mills. We and Revere distributors in all parts of the country will supply you freely.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

Executive Offices: 230 Park Ave., New York 17, N.Y.

rith, prepared for the purpose by the Celanese Corp. The two parts are so designed that they may be applied from one side by means of a special tool, which thrusts them through a hole in the partition. As the grommet is drawn together, an under cut section on one-half is engaged with a spring-locking section on the other. The tool then forces the two sections together, locking them into one integral unit at the point at which the partition stops further movement.

The "Des-Grommets" are furnished in wide range of sizes to accommodate cables and tubes from ¼ in. through 2 in. in diameter. Two sizes for wall thickness are supplied, one to accommodate ⅛ to ½ in. and the second for bulkheads ½ to 1 in. thick.

By the addition of an exterior pressure ring which is installed over the cable and locked into the grommet the installation may be made pressure and water tight up to 25 lb. per sq. in.

Simmons fastener

One-Piece Fastener Locks on Assemblies With Quarter Turn

A one-piece fastener assembly, which does not require nuts or receptacles, has been developed by the Simmons Fastener Division of the Simmons Machine Tool Corporation, Albany 1, New York. A feature of this fastener is that it eliminates the need of lock washers and will not work loose from vibration.

The single-piece construction of the fastener is self-adjusting to compensate for various material thicknesses within the range of the fastener and locks and unlocks with a quarter-turn in a 90 deg. clockwise rotation, or can be permanently installed for use as a blind rivet. The construction of the head assures one-direction rotation for locking or unlocking. A quarter-turn puts the initial twist in the spring and another quarter-turn locks the fastener in place. Spring pressure pulls the sheets together, providing a tight installation and high initial load without deflection.

Grayhill Snapit Switch With Silver Dual Contacts

The Grayhill Snapit switch is a small momentary pushbutton, snap-action type manufactured by Grayhill, 1 N. Pulaski Rd., Chicago 24. The phenolic body of the switch is round and measures ⅞ in. dia. by 1⅞ in. overall. The fixed and movable contacts are of silver overlaid on phosphor bronze. The contact gap is 0.040 in. on each of two contacts, allowing a total circuit gap of 0.080 in. Contact pressure is 35 grams, enabling it to be used with d.c. current. The current is 10 amp. at 115 volt a.c. and 2 amp. at 115 volt d.c. When the switch is operated a click is heard, indicating the switch has operated. A normally open single-pole switch is indicated by a red pushbutton and a black button indicates a normally closed switch.

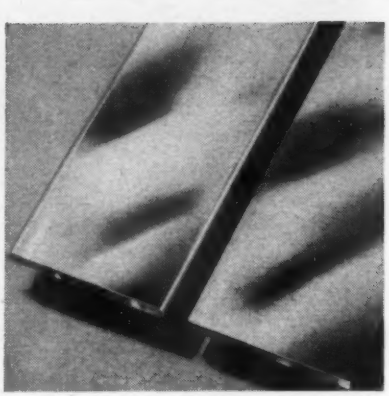
Grayhill Snapit switch

One Piece Lock Nut Clamps On Bolt With Spring Action

Tightening develops a spring or flexing action in a lock nut manufactured by the National Screw & Mfg. Co., 2440 E. 75 St., Cleveland 4. A groove in the top of the nut and an undercut in its base reduce the thickness to provide spring action. This causes a constant pressure on the upper side of the nut and the lower side of the bolt thread to lock the nut to the bolt.

Special Switch Copper Provides Superior Quality of Mill Finish

A specially prepared switch copper that eliminates hand finishing of the metal surface before assembly of the finished copper has been developed by Revere Copper and Brass Inc., 230 Park Ave., New York 17. The



Revere switch copper

superior finish of the copper causes lower losses at contact points of switches, knife blades and buses. When such parts are made of commercial bar it is necessary to obtain surfaces that would give full contact and conductivity, to resort to hand selection, sand blasting or wire brushing. The special copper provides the desirable surface throughout its length with the mill finish and requires no further preparation. The bar has no convexity when measured across the width; concavity is held to 0.001 in. per side, up to 2 in. widths; 0.002 in per side, 2 in. widths and over; camber ⅛ in. maximum in 8 ft. It is supplied in squared or round edge stock.

Steel Cables in Goodyear Belt Provide High Load Capacity

Specially twisted steel cables of fine strand, high tensile wire are imbedded in rubber and encased in a fabric envelope to form a dimensionally stable, high-load capacity drive belt manufactured by the Goodyear Tire and Rubber Co., Akron 16, Ohio. Half the cables in the belt are laid right-hand and half laid left-hand to insure a neutralized belt that will be true-running.

The rubber used in the construction is compounded to resist oil and other deteriorants ordinarily encountered in belt service. As the power loads are carried on the steel cables, the belts are not susceptible to stretching and shrinking. Once operating tension is established on the belt, it will not require take-up. This makes the belt suitable for exceptionally high-speed drives where it is able to accept the tension developed by centrifugal force and still maintain a high load tension. The excellent stability of the belt also permits its use in low-speed high-torque applications normally restricted to chain drives. The belt is produced in the same range of widths and lengths as cord and fabric carcass belts.

Crankshaft of Ranger twelve-cylinder inverted V-type inline engine with connecting rods in place, showing (arrows) Needle Bearing equipped counter-balances.

Needle Bearings Carry Crankshaft Counter-Balance on Ranger Aircraft Engines

Dampener assembly. One bolt is secured through Torrington Needle Bearing, while second bearing is held in place for insertion of second bolt, completing assembly.

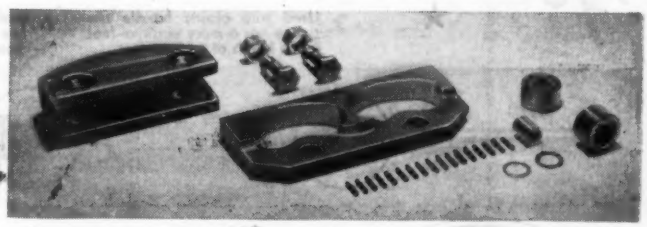
Here is an interesting application of Torrington Needle Bearings—a "cam-follower type" application—in the design of the crankshaft counter-balance of the Ranger twelve-cylinder, inverted V-type inline aircraft engine.

Two modified Type FT Needle Bearings are used to support each counter-weight, which in turn serves as a vibration dampener to provide dynamic balance on the crankshaft at high speeds.

Here again the characteristic advantages of Needle Bearing design are readily apparent: their high unit capacity due to the large number of small diameter rolls: their comparatively small O.D.; and the simplicity of their installation make them ideal for this and many other applications where dependability and long, maintenance-free service life are essential.

Perhaps these features will suggest an application where you can use Needle Bearings to improve efficiency, increase service life or effect cost economies through simplification of design or production steps.

Remember—there's a type and size Torrington Needle Bearing to meet virtually every requirement. If you haven't the latest information on file for ready reference, send today for our combined catalog and application handbook, No. 30-A.

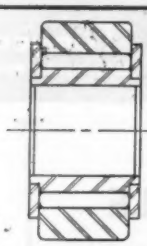


Dis-assembled view showing counter-weight parts, and detail of the modified Type FT Needle Bearing.

THE TORRINGTON COMPANY

TORRINGTON, CONN. • SOUTH BEND 21, IND.

New York Boston Philadelphia Cleveland Detroit Seattle
Chicago San Francisco Los Angeles Toronto London, England



The FT-Torrington Needle Bearing designed for Heavy Rolling Loads

TORRINGTON NEEDLE BEARINGS

TURNER PLAST-O-LOCK

(Patent Applied For)

GAUGE SAYS STOP

on its NOT GO member!

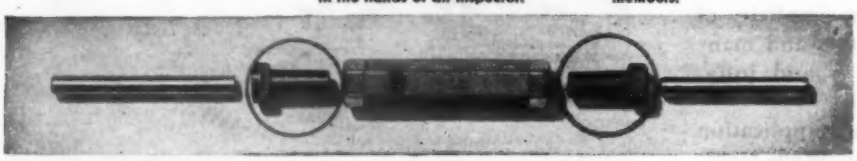
Here's another first by Turner—a *red* plastic collet to more quickly identify the "not go" member of your plug gauges! Plast-O-Lock gauges are great time savers wherever they are used.

Turner's Plast-O-Lock (patent applied for) collet type plug gauges are not only easier to use but they will multiply the life of plug gauges many times. The reason for this is obvious. Because Plast-O-Lock features a collet of plastic, slotted and tapered to fit into the tapered end of a standard plastic handle, it is possible for the gauges to be held securely without their surfaces being scratched or burred, thereby allowing use of most of the gauge's length. For example, as the "go" and "not go" ends are worn beyond allowed tolerances they are simply cut off, thus leaving an unused end ready for gauging. To illustrate further, if a boring no deeper than ⅛" is being checked, as many as 8 fresh gauging sections may be obtained from one standard length "go" gauge as furnished with Turner's Plast-O-Lock. This obviously eliminates the necessity of salvaging used gauges.

For full particulars about Plast-O-Lock gauges wire or write us today.

★ *Features* ★

1. Multiplies the life of the plug gage.
2. Collet will not mar a lapped or polished surface.
3. Used with plastic handle the gauge has a more sensitive feel in the hands of an inspector.
4. Is easy to make length adjustment because slot is provided for end wrench.
5. Plast-O-Lock size range from .050 to .690.
6. Red plastic collet for quick identification of "not go" members.



TURNER BROTHERS

DELIVERY Fast delivery can be made on these Plast-O-Lock gauges as well as the following Turner gauges: ring, flush pin, snap and built up.

TURNER GAUGE GRINDING COMPANY
2625 HILTON ROAD • • • • FERNDALE, MICH.

Sizes AVAILABLE

Plug Size Range	Length of "Go" Gauge	Length of "No Go" Gauge
.050 to .099	1⅞	1⅜
.100 to .149	2	1½
.150 to .199	2¼	1¾
.200 to .249	2½	2
.250 to .499	3	2
.500 to .690	3½	2½

HOW TO ORDER PLAST-O-LOCK

1. Diameter.
2. Length of gauging surfaces.
3. Tolerance or accuracy.
4. Hardened alloy steel or chrome, tungsten carbide or Nor-Bide.
5. Number of members—Go, Not Go, Handles.
6. Complete marking instructions.

TRADE PUBLICATIONS

Abrasive Cutting Machine — An eight-page catalog describing the Campbell Hudorkut Model No, 1 abrasive cutting machine. Andrew C. Campbell Division, American Chain & Cable Co., Bridgeport 2, Conn.

Air Tools—Folder of air-operated tools for maintenance, construction and demolition work. Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

Blast Cleaning—A 24-page booklet describing air and airless blast cleaning and dust control equipment and methods for a variety of purposes. Pangborn Corp., Hagerstown, Md.

Belting—A belting chart containing specifications for belt thicknesses and information on fastener and lacing sizes for each thickness. Baldwin Belting Inc., 35 Chambers St., New York 7, N. Y.

Castings—Brochure containing information and data on magnesium castings with a comparison of properties of castings of other metals. Superior Bearing Bronze Co., Inc., 140 Banker St., Brooklyn 22, N. Y.

Castings—Bulletin No. 22 "Stories of Meehanite in Industry," 128 pages, contains a reprint from trade publications of articles on Meehanite castings. Meehanite Research Institute of America, Inc., Pershing Square Bldg., New Rochelle, N. Y.

Dividing Head Chart—Card chart with index table for universal dividing heads 6 to 12 in. Purchasable for $1.00. Jefferson Machine Tool Co., Fourth, Cutter and Sweeney Sts., Cincinnati 3, Ohio.

Electrical Test Equipment—Bulletin "Electrical Test Instruments" describes a variety of testing equipment for industrial use. Industrial Instruments, Inc., 17 Pollock Ave., Jersey City, N. J.

Gear Cutting—A four-page bulletin No. 1843-44 describes the "Shear-Speed" gear cutting machine, capacity up to 4 in. diameter and 2 in. face width. Michigan Tool Co., 7171 E. McNichols Rd., Detroit 12, Mich.

Gloves and Aprons—A catalog section on all-synthetic industrial rubber gloves and plastic-treated industrial aprons. The B. F. Goodrich Co., Akron, Ohio.

Management — A 40-page booklet "Production Management," and how

WHAT IS PLUNGE GRINDING OF THREADS WITH CRUSH DRESSED WHEELS?

What are the advantages of ground threads?

Threads can be ground after stock is hardened, eliminating the ill-effects of distortion or surface decarburization from heat treating—especially desirable in the case of tubes and other thin-walled components. Critical thread elements are accurately produced and held concentric with other ground diameters and threaded sections.

How can threads be ground most quickly?

By plunge grinding with a crush dressed multi-ribbed wheel on the Precision Thread and Form Grinder made by the Sheffield Corporation, Dayton 1, Ohio.

What is plunge grinding of threads?

It is the production of a full threaded section equal to the width of a crush dressed multi-ribbed wheel in one quick operation of less than two revolutions of the work.

To what can plunge grinding be compared?

It takes much less time than required with thread hobbing, is far more accurate, and tooling costs are considerably lower.

Is thread plunge grinding fast?

Definitely yes! The wheel is fed into full depth in ⅓ to ½ revolution of the work, and only one additional revolution is required to complete the threaded part. Sections of threads up to 1¼" in length can be quickly produced by plunge grinding on the standard Sheffield Precision Thread and Form Grinder. Special capacity machines are available for other lengths and sizes.

Does plunge grinding produce threads to an accuracy of class 3 fit?

Unusual uniformity of thread angle, lead and pitch diameter is commercially possible with the Sheffield Precision Thread and Form Grinder especially designed for plunge grinding. Thick first and last threads are eliminated in plunge grinding. On this machine, plunge grinding produces commercial work to not less than a Class 3 Fit accuracy in all cases—and to Class 4 Fit in many.

How can more information be obtained on plunge grinding?

By writing to the Sheffield Corporation, Dayton 1, Ohio.

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it affects productivity, costs and employment. Albert Ramond and Associates, Inc., Chrysler Bldg., New York 17, N. Y.

Metals—A 16-page bulletin on Rigidized metals describes typical war and postwar applications of this type of sheet and strip metal. Rigid-Tex Corp., Buffalo 3, N. Y.

Paint—Slide-rule type of guide for selection of priming and finishing paint coats for surfaces, including coverage and drying time. American Marietta Co., 43 East Ohio St., Chicago, Ill.

Planers—Illustrated Bulletin No. 190, covering Baldwin Southwark medium and heavy-duty plate planers. The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia, Pa.

Pumps—A 20-page illustrated booklet describing the installation and operation of self-priming centrifugal pumps. Marlow Pumps, Ridgewood, N. J.

Pumps—Sure-Flow centrifugal coolant pumps are described in a 28-page bulletin, which also contains tables showing friction of viscous liquids and water in pumps. Logansport Machine Co., Inc., Logansport, Ind.

Radium Paint—Folder describing radium paint applications on instruments and devices used in dark places. The Lustrolite Cleveland Corp., 6927 Carnegie Ave., Cleveland 3, Ohio.

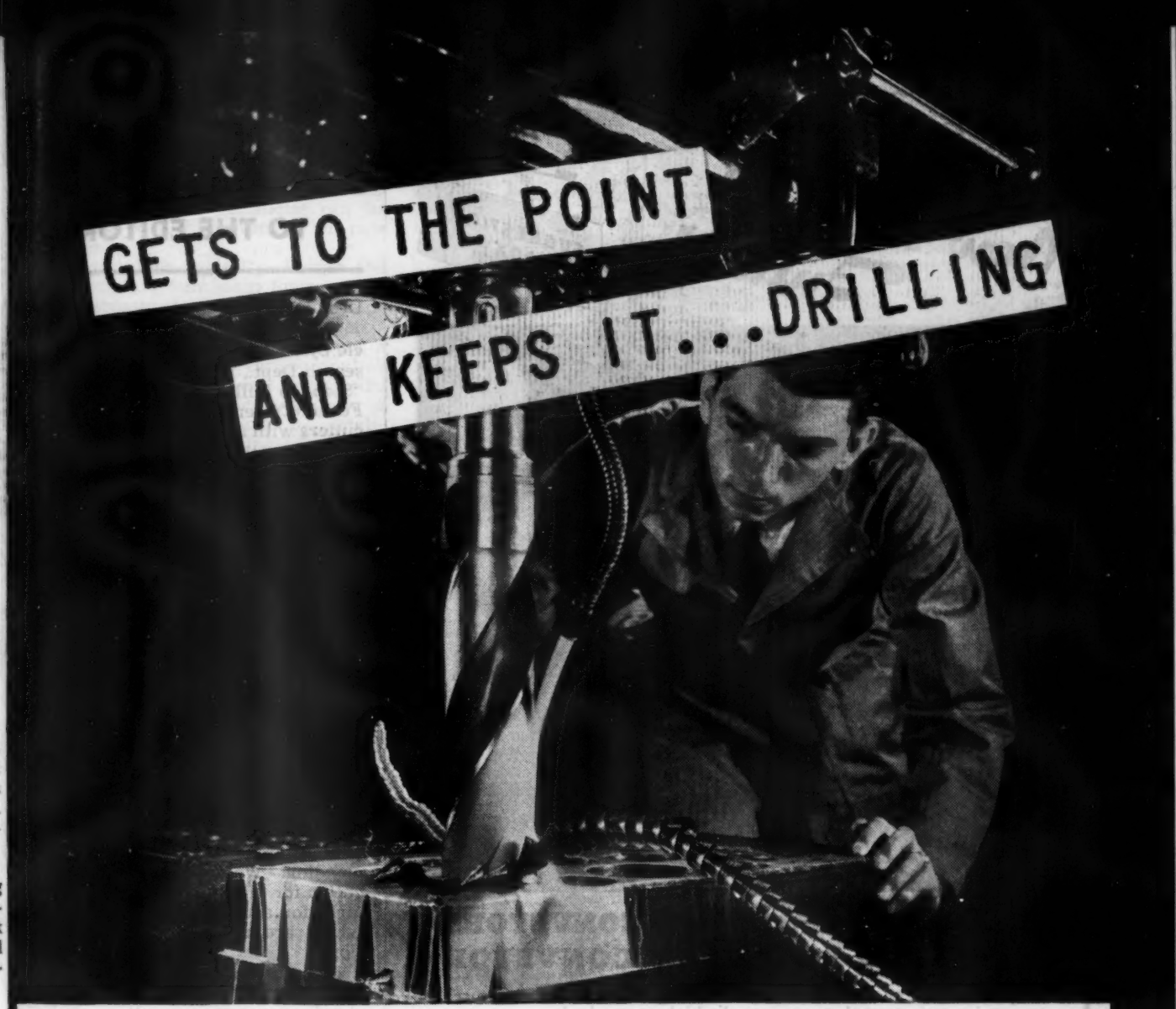
Thermostats—A 20-page booklet of thermostatic controls for automatic control of temperatures up to 650 F. for all types of industrial heating. Westinghouse Electric & Mfg. Co., P. O. Box 868, Pittsburgh 30, Pa.

Tool Bits—Mill-treated, high-speed steel toolholder bits are described in a catalog, with detailed specifications, including notes on grinding and methods of mounting. Allegheny Ludlum Steel Corporation, Brackenridge, Pa.

Vibration Control — Bulletin with rated loads, weights and dimensions of six sizes of vibration absorbing devices with load capacities from 200 to 12,000 lbs. The Korfund Co., 48-15 32nd Place, Long Island City 1, N. Y.

Washing Equipment—Bulletin No. 4E1 covers equipment for washing, rinsing pickling and drying metal parts. Optimus Equipment Co., 151 Church St., Matawan, N. J.

Welding—Six-page folder describing low temperature welding rods for maintenance and repair of shop



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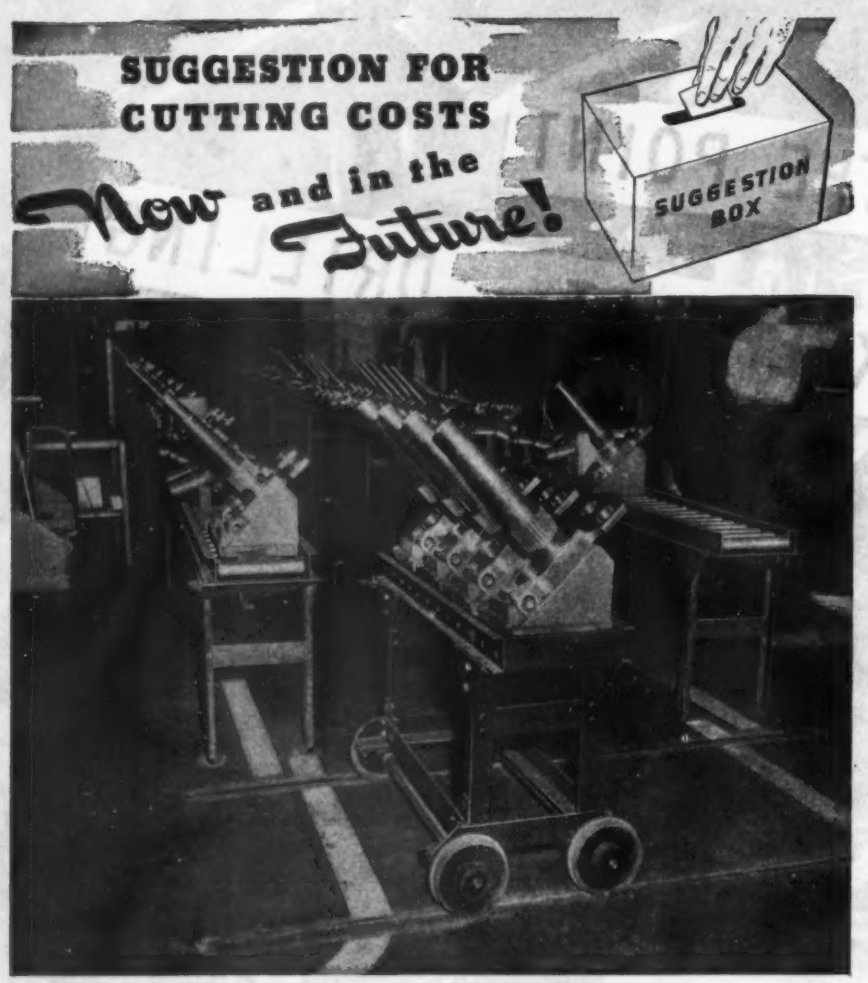

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Besides roller, Standard builds belt, chain, slat, and push-bar conveyors, also spiral chutes, tiering and lifting machines, portable pilers, and pneumatic tube systems.

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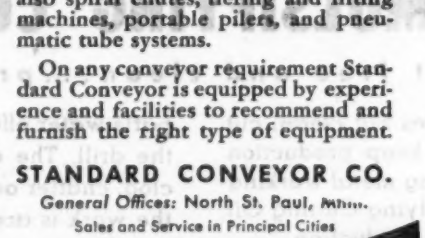

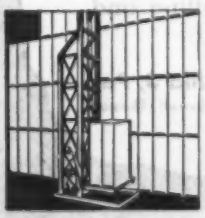
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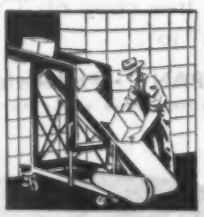
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equipment. Eutectic Welding Alloys Co., 40 Worth St., New York 13, N. Y.

TO THE EDITOR

Dear Sir:

This is an endorsement of an article by Arthur A. Schwartz, Tool Research Dept., Bell Aircraft Company, "Step Up Milling Efficiency by Using Fewer Cutter Teeth," about milling cutters with a small number of teeth.

Rather than use conventional speeds of 70 to 100 r.p.m., we can use 200 to 250 r.p.m. and feeds of 2 to 8 in per min., for both roughing and finishing cast iron and high tensile steels, when these cutters are applied correctly. Strangely enough, these cutters leave a finish much superior in most cases and, in some formed work, the finish can be termed polished.

Bevel gear cutters, in coarse pitches of 2, 3 and 4 D.P., run cooler, double the output between the grinds, and quite often cut overall milling time down to one third.

Side and face cutters, of four-tooth design, operate at about the efficiency noted above, while formed and angular work require about half the customary work time and regrinding. We are using this type of cutter for all formed work, particularly for acute angles in deep cuts, which are usually difficult operations.

These statements have been proved in our shops. Because of our outstanding success, our cutters are being altered and we are now manufacturing them commercially.

Taking into consideration the savings of high-speed steel and production time, it is a "secret weapon" of far more importance than production men of our Allied nations realize.

Yours truly,
R. A. SCHULTZ,
Noblet & Forrest,
Woodville, South Australia

NEW BOOKS

PRODUCTION LINE TECHNIQUE—*By Richard Muther, instructor, Department of Business and Engineering Administration, Massachusetts Institute of Technology. 320 pages. Published by the McGraw-Hill Book Co., 330 West 42 St., New York 18, N. Y. $3.50.*

Line production is an American institution. It was developed in this country and upon it rests the manu-

facturing accomplishments that have resulted in economically produced goods, together with a high-wage rate. War production particularly has demonstrated how this mass production technique can be applied to a high variety of new needs.

The author logically divides the subject into four main topics. First he discusses the advantages and limitations of line production, emphasizing that it cannot be used as a cure-all, but that it can be applied successfully under certain specific conditions. Next he tells how a production line should be established. This section includes many practical pointers on the selection of equipment, movement of material and plant layout. Thirdly, it tells how the line should be operated, once it has been established. A casual visitor witnessing the movement of a production line may think that it runs itself, but this is far from true. Materials control, production intervals, quality, and perhaps most important of all, the question of personnel must be carefully weighed in order to insure continuity of operation.

Lastly the author considers the subject of diversification in line production. It has been found that many modifications of line manufacture can be adapted to products involving less than mass production, if sound engineering is employed. This section goes into the question of flexibility and production line modifications. It also considers some of the difficulties likely to occur in line production and the means for coping with them.

No doubt the postwar period will see continued growth in the principles of line production. For this reason the volume is timely and of particular interests to those whose duty it is to correlate wages and product costs.

•

CORRECTION

ANALYSIS OF DRILL JIG DESIGN—*By J. I. Karash, plant engineer, Reliance Electric & Engineering Company. Published by the McGraw-Hill Book Company, 330 W. 42 St., New York 18, N. Y.*

This book reviewed in a recent issue was erroneously listed as costing $2. Its correct price is $3.

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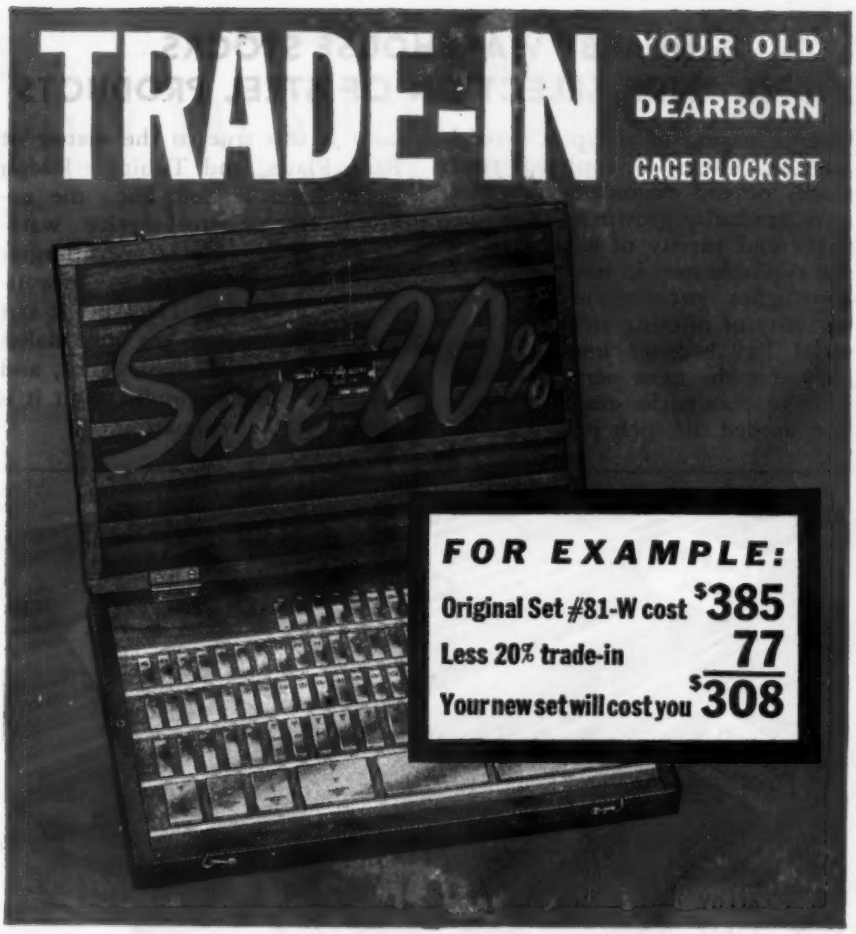
SEEN and HEARD

By JOHN R. GODFREY

Cutter Body Material

MATERIAL USED in cutter bodies may be more important than many think. And it is not only strength that counts, the nature of the ma-



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On all other makes of gage block sets we will allow a 10% discount on a new Dearborn set when you turn in these used sets for reconditioning.

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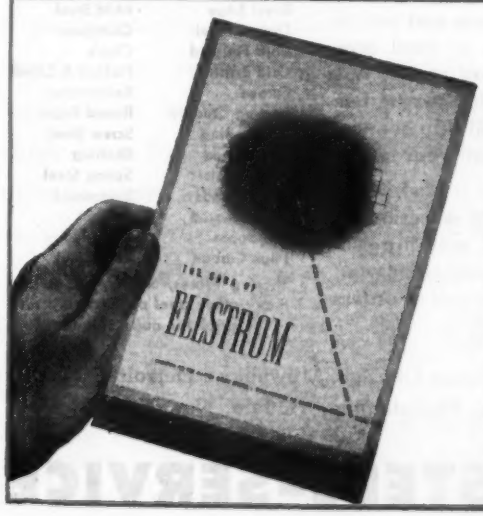

HOW THE GAGE BLOCK ORIGINATED

Here is the very interesting story of the development of the gage block from its conception in Sweden, at the turn of the century, to the present. It will be sent to you on request. Just write Dearborn Gage Company, Dearborn, Michigan, today for your free copy.

(Advertisement)

NEARBY WAREHOUSE STOCKS OFFER WIDE SELECTION OF STEEL PRODUCTS

Over a period of the past several months, the once depleted steel stocks of the nation's warehouses have gradually grown in both tonnages and variety of sizes. Today, the available steel in some instances approaches pre-war levels. The necessity of offering substitute material has become less frequent. Now, for the most part, it is possible to obtain the exact specification needed for each job. Particularly is this true in the matter of Bars, Plates, and Tubing. Joseph T. Ryerson & Son, Inc., the nation's largest steel-service warehouse organization reports largest stocks in years now on hand awaiting your orders. They point out that the right steel not only makes your work easier, saves labor, and produces a better product, but it is also the most economical.

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When specifications call for bar steel, phone Ryerson. You'll save time, trouble and money—get the bar exactly right for your job—because Ryerson stocks include practically every shape and size of bar, in practically every analysis of steel now available. Whether it's straight carbon or alloy, hot rolled, cold finished or heat treated, Ryerson has the right bar in nearby stock and will ship at once. The nation's largest steel stocks are your surest source for just the bar you need.

If you have a question of steel selection or application, experienced Ryerson metallurgists and engineers will be glad to work with you. There is no obligation. Inquiries as well as orders receive prompt attention.

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RYERSON STEEL-SERVICE

terial is equally important. An instance of this comes to light in the saw-like cutters used in milling the cooling fins on forged cylinder heads of air-cooled airplane engines.

Steel bodies with carbide tips do not prove as satisfactory as cutters made with a Meehanite body, even though the cutters are of thin section. The steel cutter bodies are more resilient and seem to "weave" under the vibration of the teeth contacting the work. Meehanite absorbs these vibrations and retains its shape much better. The "weaving" of the steel-bodied cutters plays havoc with the fins, which are very thin.

Helicopters—1907?

Few realize how this publication has been tied up with aircraft and motor cars since their very beginning. Away back in 1898 it illustrated a radial engine with revolving cylinders for an automobile that was built for five years. Then in 1908 an editor was sent to watch the airfoil tests away up in New Brunswick. Two years later it covered the first aviation meet at Belmont Park which was the beginning of real aviation in this country, following the early flights of the Wrights and Curtiss.

Most interesting of all, perhaps, is the fact that in 1907 Emil Berliner (the man who made the first disk records) bought two of these revolving cylinder engines for a *helicopter*. It is not clear whether that machine was ever built, but the idea was "a-sproutin" away back when. And this engine was built by an old-time builder of machine tools and appliances, the Adams Company of Dubuque, Iowa.

Standard Screw Threads

BY H. C. FRANKLIN

THE DELAYS AND EXPENSE caused by securing satisfactory fits with Whitworth threads in this country has emphasized the desirability of a world standard thread form. With this in view there have been numerous conferences on both sides of the Atlantic, and hope is expressed that some standard may result.

In aircraft and other work where threaded parts are highly stressed, there is no question as to the advantage of the rounded root on screw threads. While the American form is easier to produce, there are two sharp corners at the bottom of the thread until the threading tool wears on these corners. When ro rounded, either by wear of the tool or intentional rounding (which is permissible within limits), the thread has the same advantages as the Whitworth in preventing the de-

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4. Case "take-down" to clean, oil or replace blade, has been simplified.

5. Redesigned case makes inside measuring deadly accurate and eliminates guess work.

6. Case — of high grade tempered steel — is chrome plated for protection.

7. Graduations permanently etched on high carbon spring steel blade . . . both sides, all edges.

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velopment of cracks plus the fact that, for the same diameter screw, the root diameter is slightly larger.

Some have suggested rounding the corners on the American form of thread, but this seems hardly feasible except on very coarse pitches. It would be much more practicable to round the whole bottom of the thread, decreasing the depth if found desirable to secure a larger root diameter.

This striving for additional strength brings to mind the practice of the old Hoopes & Townsend Company in Philadelphia, half a century ago. It was their practice to make ¼-in. bolts 1/32 in. oversize, or 9/32 in. instead of the ¼ in. at which they were listed. This company's contention was that ¼ in. was too small for any use so they gave the bolts added strength. As a result only Hoopes & Townsend nuts could be used on their bolts. It was such lack of uniformity which led to the first Screw Thread Standards Committee of the American Society of Mechanical Engineers before World War 1.

Now we need a world standard for the benefit of all nations.

Cleaning a Contact Path On Enameled Wire

BY MICHAEL AXLER

SPECIFICATIONS required that a path be cleaned in the enamel insulation on coils of transformers being manufactured for the Army and Navy, so that a rotor could make good contact. Undulations in the wire had to be leveled off first in order to allow proper cleaning. This was formerly accomplished with a small ball-peen hammer and a strip of 1/16 in. bakelite, but frequently caused dents in the wire because of the thinness of the bakelite. A small paring knife was afterward used to scrape the enamel from the wire, which was rubbed smooth with sandpaper. This method, however, proved unsatisfactory.

A piece of bakelite ½ in. thick, or even thicker, which would cover the coil completely, was recommended and the coil was smoothed out by tapping with a plastic-topped hammer. This insured more even distribution of the hammer blows.

Rotary wire brushes, mounted on a buffing outfit stand, were then used to remove the enamel coating for the path in the wire. The brushes were of various sizes, according to the gage of the wire to be cleaned, coarse wire requiring stiff brushes and fine wire soft ones. Paths on these coils are now cleaned in the average time of 1 min., 10 sec., as against the former time of 20 min. per unit.

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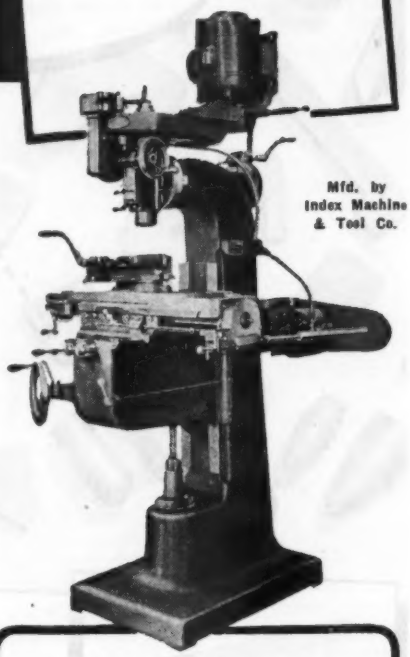
will help you on your tool, die and production work. In addition to micrometer dials on screws, verniers are standard equipment for cross and longitudinal locating. If finer precision is desired, rods and indicators are available. These in conjunction with power feed to a precision ball bearing spindle make a very versatile machine for milling, drilling and boring. *Literature promptly mailed on request.*



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Write for new Bulletin 43-11 which includes description of construction, operation and types of controls, installation drawings, performance characteristics, installation and operating instructions of Vickers Variable Delivery Piston Type Pumps.

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CHICAGO • CINCINNATI • CLEVELAND • PHILADELPHIA • LOS ANGELES
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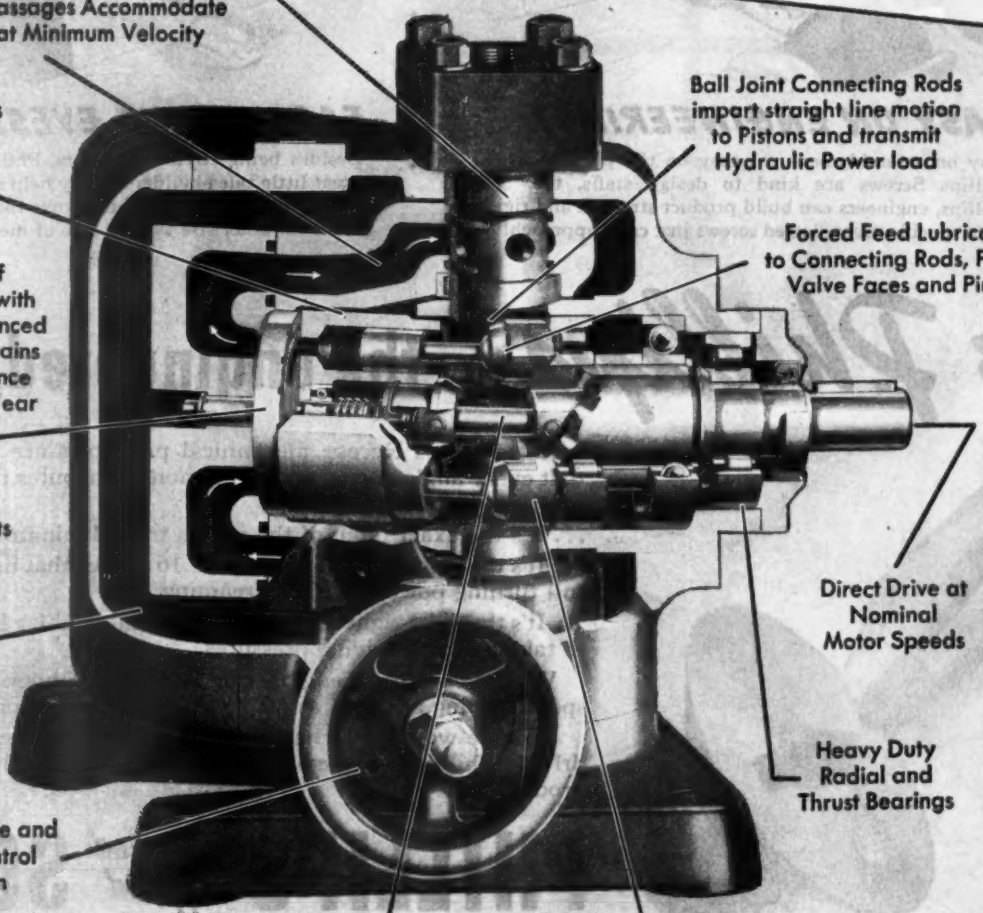

Hydraulically Balanced Pintles
Large Oil Passages Accommodate Oil Flow at Minimum Velocity
Multiple Cylinders Arranged Axially
Valve Plate of Ball Race Steel, with Hydraulically Balanced Valve Face Maintains Optimum Clearance and Minimizes Wear
All Working Parts Submerged in Continuously Circulating Oil
Interchangeable and Optional Control Mechanism
Floating Universal Joint Shaft does not transmit Hydraulic Power load
Driving Flange Integral with Drive Shaft
Heavy Duty Radial and Thrust Bearings
Direct Drive at Nominal Motor Speeds
Forced Feed Lubrication to Connecting Rods, Pistons, Valve Faces and Pintles
Ball Joint Connecting Rods impart straight line motion to Pistons and transmit Hydraulic Power load

There Are More Than 5,000 Standardized VICKERS Units For Every Hydraulic Power and Control Function

EASY ON MEN!

Hand driving screws into garnish molding is slow, hard work. But as long as he used slotted screws, this world-famous manufacturer of automobile bodies didn't dare risk power driving. Driver skids came too high – and too often!

EASY ON THE POCKETBOOK!

A change to Phillips Recessed Head Screws ruled out driver skids . . . permitted use of power methods. Also eliminated one operation involving countersunk washers. All of which added up to substantial cost-savings!

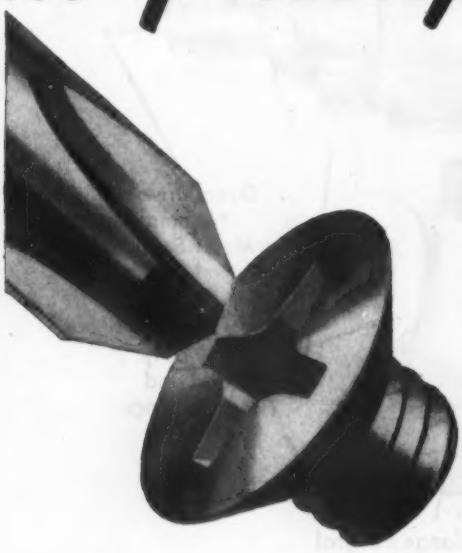
EASY ON ENGINEERING!

Easy on assemblymen . . . easy on the pocketbook . . . Phillips Screws are kind to design staffs, too. With Phillips, engineers can build product strength and rigidity up to specifications slotted screws just can't approach!

EASY ON THE EYES!

Besides being strength-builders, Phillips Screws are also great little sales-builders. They help dress up any product . . . do away with unsightly burrs that snag clothing and make an otherwise sweet piece of merchandise look sour!

It's Phillips — the engineered recess!



In the Phillips Recess, mechanical principles are so correctly applied that every angle, plane, and dimension contributes fully to screw-driving efficiency.

. . . It's the exact pitch of the angles that eliminates driver skids.

. . . It's the engineered design of the 16 planes that makes it easy to apply full turning power – without reaming.

. . . It's the "just-right" depth of recess that enables Phillips Screw Heads to take heaviest driving pressures.

With such precise engineering, is it any wonder that Phillips Screws speed driving as much as 50% – cut costs correspondingly?

To give workers a chance to do their best, give them faster, easier-driving Phillips Recessed Head Screws. Plan Phillips Screws into your product now.

PHILLIPS *Recessed Head* SCREWS

WOOD SCREWS • MACHINE SCREWS • SELF-TAPPING SCREWS • STOVE BOLTS

Made in all sizes, types and head styles

25 SOURCES

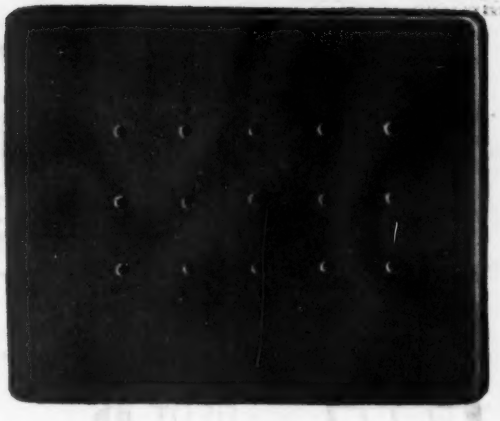
American Screw Co., Providence, R. I.
Atlantic Screw Works, Hartford, Conn.
The Bristol Co., Waterbury, Conn.
Central Screw Co., Chicago, Ill.
Chandler Products Corp., Cleveland, Ohio
Continental Screw Co., New Bedford, Mass.
The Corbin Screw Corp., New Britain, Conn.
General Screw Mfg. Co., Chicago, Ill.
The H. M. Harper Co., Chicago, Ill.
International Screw Co., Detroit, Mich.
The Lamson & Sessions Co., Cleveland, Ohio
Manufacturers Screw Products, Chicago, Ill.
Milford Rivet and Machine Co., Milford, Conn.
The National Screw & Mfg. Co., Cleveland, Ohio
New England Screw Co., Keene, N. H.
Parker-Kalon Corp., New York, N. Y.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Manufacturing Co., Chicago, Ill.
Reading Screw Co., Norristown, Pa.
Russell Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Manufacturing Co., Waterville, Conn.
Shakeproof Inc., Chicago, Ill.
The Southington Hardware Mfg. Co., Southington, Conn.
The Steel Company of Canada Ltd., Hamilton, Canada
Wolverine Bolt Co., Detroit, Mich.

15 holes in 15 minutes

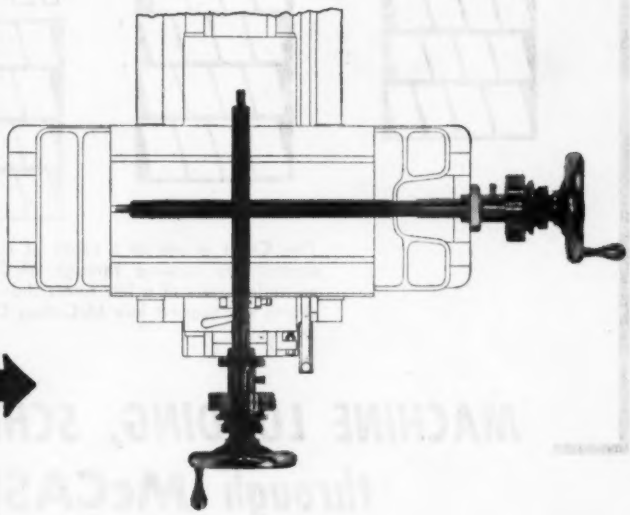
Spotted, Drilled and Reamed to ±.0002"

by the

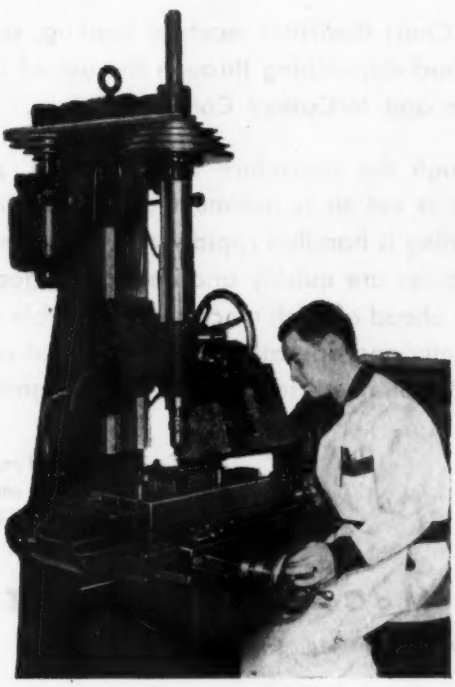
Coordinate Hole Location Method*



...because
Micrometer Lead Screws
Accurate to
.0002" in 16 inches



...Speed Table Settings
on the
MOORE JIG BORER

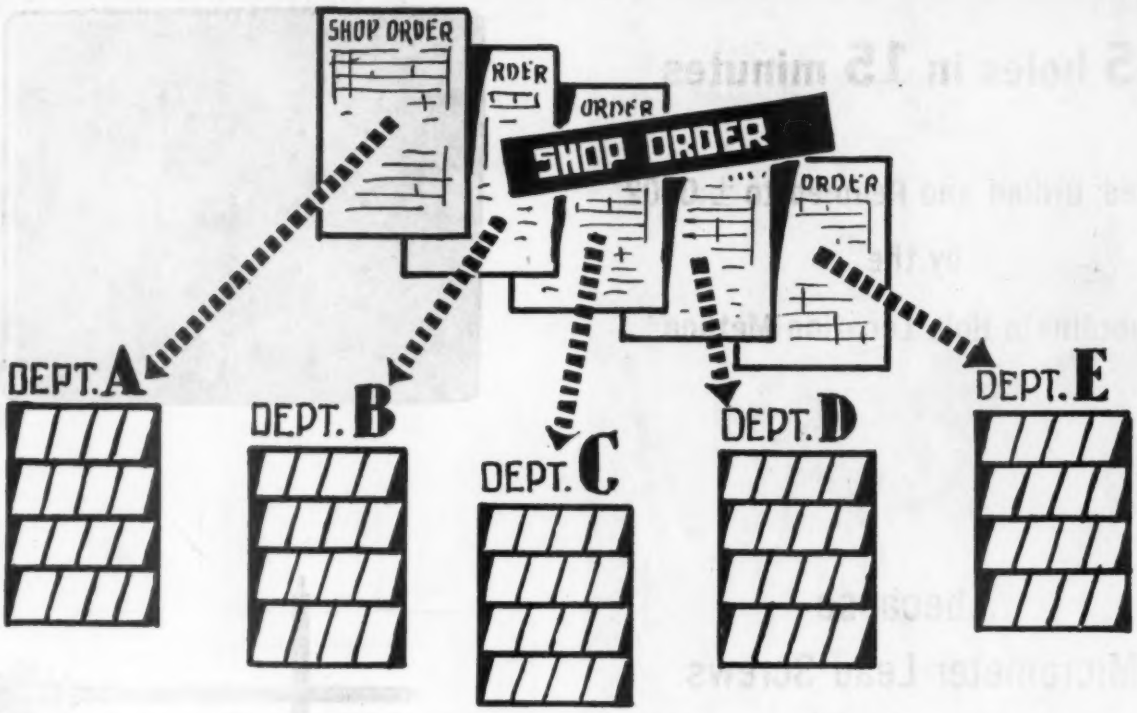


*One boring out to increase accuracy to ±.0001" would require only five minutes additional time for all fifteen holes. Write for descriptive literature.

MOORE TOOLS

MOORE JIG BORER

MOORE SPECIAL TOOL CO., INC., 738 Union Avenue, Bridgeport 7, Conn.



This Chart is one of a series of eight suggesting how various elements of control are secured through McCaskey by the visualizing and flow of multiple copies of a few forms that are already in use in most plants. These charts will suggest how McCaskey Control will meet your specific production problems.

MACHINE LOADING, SCHEDULING and DISPATCHING through McCASKEY CONTROL

This Chart illustrates machine loading, scheduling and dispatching through the use of a shop order and McCaskey Control Sections.

Through the procedure recommended, paperwork is cut to a minimum . . . departmental planning is handled rapidly and accurately . . . schedules are quickly and easily changed. The load ahead of each machine is available almost instantly and operations are performed according to planned schedules. Job assignment is practically automatic; no delays occur while employees and machines wait for jobs.

SEND AT ONCE FOR

a copy of "The ABCs of Production Control" from which the above chart is reproduced and in which are covered a wide range of applications of control visualized simply and clearly to show how McCaskey Control operates. One of the systems shown or an adaption of it will fit your specific needs. WRITE FOR YOUR COPY TODAY.

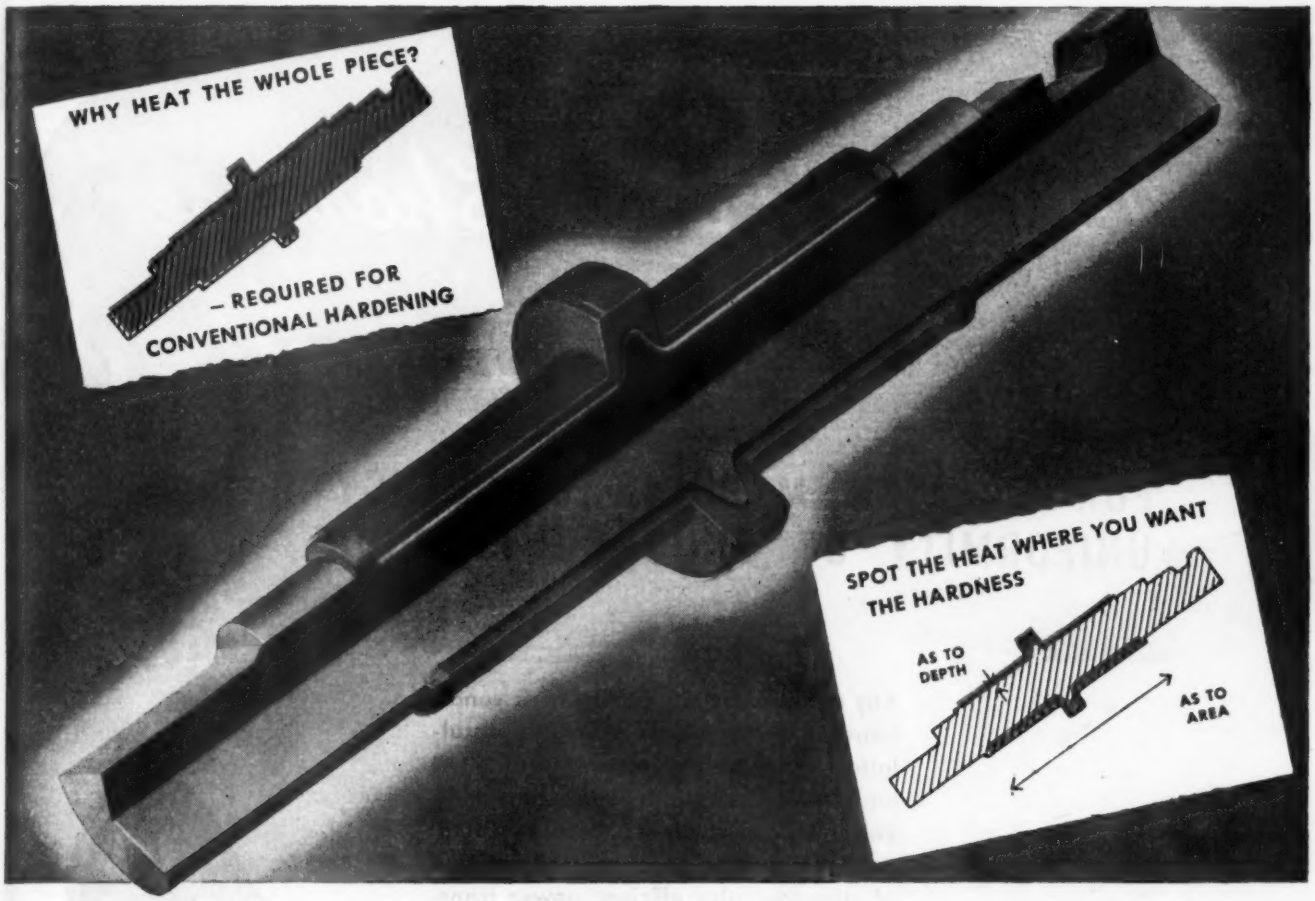
A McCaskey industrial representative, qualified by training and experience, is available to help you analyze your requirements and suggest the McCaskey Control that will best meet them. No obligation, of course.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL


WHY HEAT THE WHOLE PIECE?
— REQUIRED FOR CONVENTIONAL HARDENING
SPOT THE HEAT WHERE YOU WANT THE HARDNESS
AS TO DEPTH
AS TO AREA

HOW TO CUT COSTS... IMPROVE QUALITY WITH TOCCO LOCALIZED HARDENING

FAST. By confining heating to the area subjected to wear . . . and by hardening only the wearing surface, TOCCO Induction Hardening cuts treatment time from hours to seconds.

SUPER-HARD AND STRONG. Since this localized treatment does not affect the part's core, there need be no compromise between hardness and toughness. It produces super-hardness without reducing previous strength and ductility.

STRAIGHT. TOCCO speed minimizes warpage . . . eliminates straightening operations.

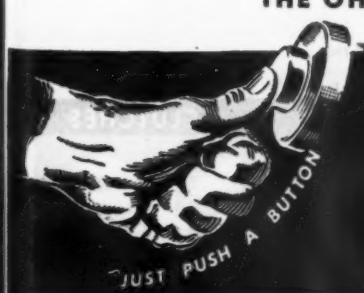
UNIFORM. Split-second timing of TOCCO'S high-frequency induction heat makes every treatment exactly the same.

GOOD WORKING CONDITIONS. TOCCO machine is cool, clean, compact . . . simple for anyone to operate.

THE PART ILLUSTRATED . . . a track roller shaft, 16½" long, for a military bulldozer tractor . . . is TOCCO Hardened at flange and bearings. Flange, 4" diam., is hardened to 50-60 R.C. . . . eight shafts at a time . . . total time, including heating and quenching, 94 sec. or less than 12 sec. per flange. TOCCO machine was designed especially for this application.

Feel free to enlist the TOCCO Engineer in solving *your* heat treating problems. Write for free copy of "Results with TOCCO."

THE OHIO CRANKSHAFT COMPANY · Cleveland 1, Ohio



TOCCO

INDUCTION

HARDENING, BRAZING

ANNEALING, HEATING

Offsetting Labor Shortage with CHAIN Drives!

FOR GREATER MACHINE EFFICIENCY AND UNIFORMITY OF FINISHED PRODUCT . . .

Any time, under any atmospheric conditions, either on minute or mighty installations, you can depend on Morse Silent and Roller Chain to deliver a constantly uniform flow of power, because *Teeth, not Tension,* means no slip! Elimination of slippage, plus efficient power transmission assures maximum machine output, "precise" delivery, and reduction of scrap costs.

Whatever your power transmission problem, it will pay you to investigate Morse. Morse Silent Chains are delivering up to 99.4% efficiency with smoothness and quietness only Morse Drives can give. And with all their advantages, Morse Chain Drives cost no more than ordinary drives. Get full information. There's a Morse man near you—or write direct to Morse, Ithaca or Detroit.

Typical Silent Chain Drive

Typical Roller Chain Drive

Teeth Not Tension

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE Roller and Silent CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

THE SCHATZ MANUFACTURING COMPANY

BALL BEARINGS

and

Acme BALL BEARING CASTERS

POUGHKEEPSIE, N. Y.

REPRESENTATIVES LOCATED AT

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an element of Victory

OH 38

Easily Machinable

An Aluminum Alloy—Non-Heat Treated. The perfected metal that surpasses all others for a wide variety of machining operations. Non-corrosive—Easy on machine tools—Holds threads without stripping. Its light weight reduces table and machine loads and increases tooling accuracy. 5 years of proven superiority in hundreds of plants. OH 38 is an exclusive Hedstrom product.

Write for Literature

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OSCAR W. HEDSTROM CORP.
4812 West Division St., Phone Columbus 3667, Chicago, Ill.
Manufacturers of Aluminum, Brass, Bronze and High Conductivity Copper Castings. Pattern Makers. Complete Mechanical Assemblies and Models to Specifications

"TAILORED" TO THE JOB—

Combination Rotary Geared and Centrifugal Pumps, flanged mounted. Such pumps can supply coolant and at the same time lubrication or hydraulic power.

Frequently, with only minor changes, Brown & Sharpe Stock Pumps can be adapted for special installations or combinations, simplifying problems of coolant supply, lubrication, transfer or hydraulic operation. Complete Pump Catalog sent on request. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

GEARED — VANE — CENTRIFUGAL — MOTOR DRIVEN

BROWN & SHARPE PUMPS

Available from Stock

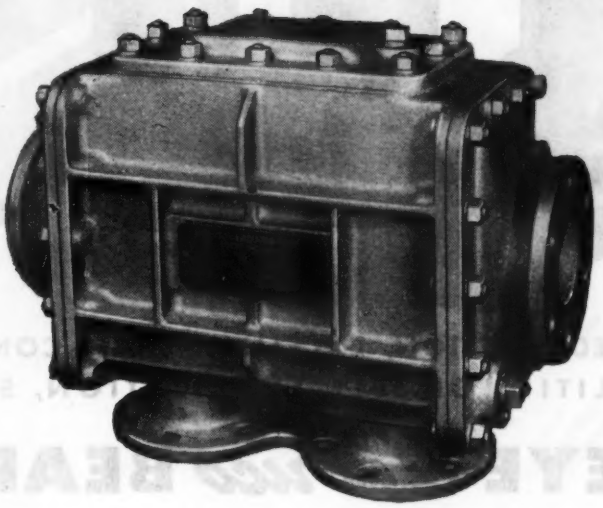
= 0-80 and = 1-72
SCREWS and NUTS
Brass or Steel, Cut Thread
Class 3 Fit

Waltham is also equipped to furnish all types of
SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.
WALTHAM, MASS.

Control Lube Oil Temperatures with HARRISON OIL COOLERS



When lube oil temperatures exceed safe limits, machine efficiency is thrown for a loss. Bearings and other critical parts wear out before their time. Shutdowns reduce output. Maintenance costs soar.

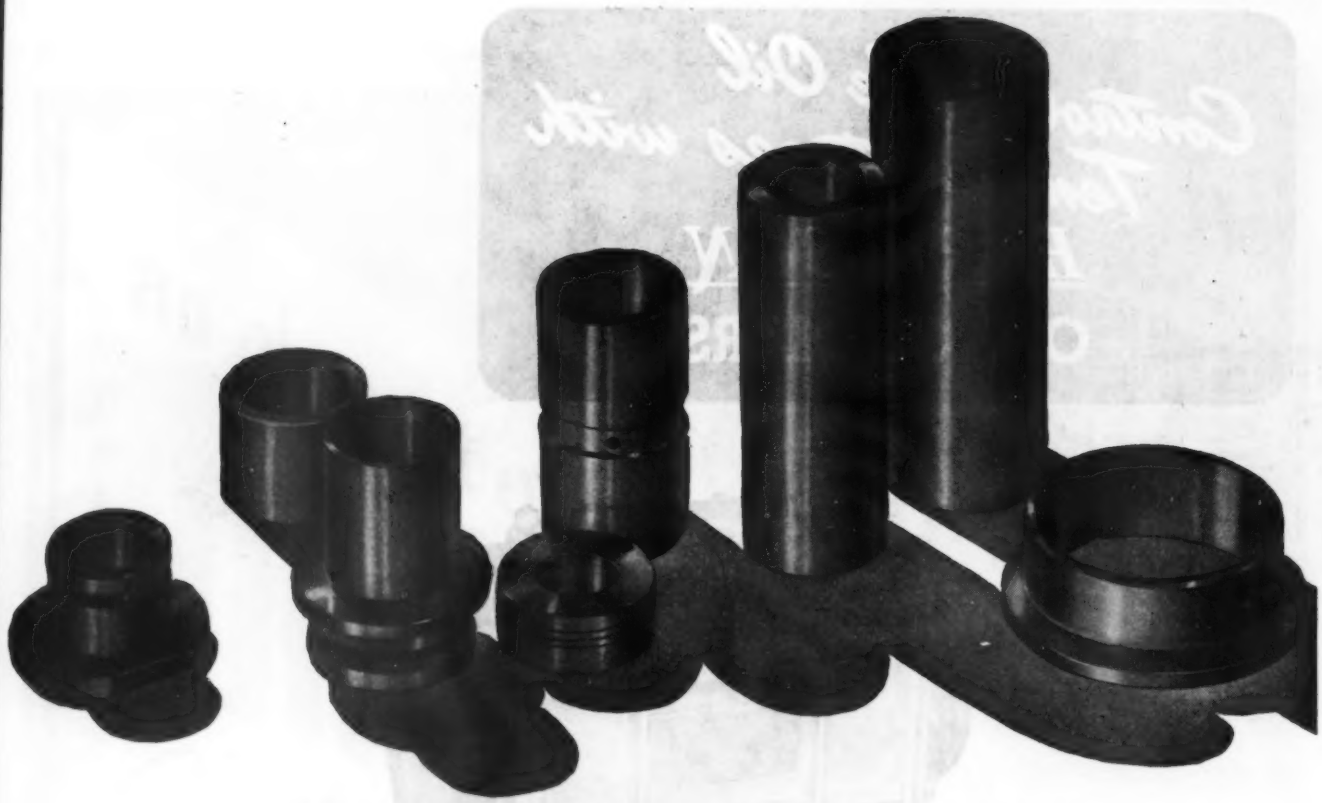
Harrison Oil Coolers stop this waste by maintaining lube oil temperatures within the range required for proper lubrication. Compact and dependable, they are safeguarding production on varied types of machine tools and industrial installations.

There is a correct cooler for your particular requirements. Consult Harrison engineers on oil cooling problems.

They're Still Counting On You—
BUY MORE WAR BONDS

HARRISON

HARRISON RADIATOR DIVISION OF
GENERAL MOTORS, LOCKPORT, NEW YORK



FOR REDUCED FRICTION, EXCELLENT SHAFT CONFORMITY, AND QUALITIES OF SELF-LUBRICATION, SELECT...

BUCKEYE *Lubrico* BEARINGS

...The exceptional quality high lead bearing that resists pounding and heavy shock, yet costs but little more than standard analysis bearings

For precision airplane parts, pumps, seal rings, high speed shafts and other services where freedom from shaft scoring and seizure —and long trouble-free operation are desired, specify "Buckeye Lubrico."

Manufactured from selected metals under Buckeye's exacting laboratory and metallurgical control assures the production of sound homogeneous bearings having a thorough and uniform dispersement of lead throughout. These bearings are free from porosity and are accurately dimensioned within the required limits assuring speedy, easy assembly.

Buckeye Lubrico Bearings can be furnished in any of our 1088 standard stock sizes—in 13″ cored or solid bars—or in any OD, ID and length, slotted, drilled, flanged or threaded exactly to customer's blue-print ... in three different metal analyses to meet exactly the requirements of light high speed, general, and extremely heavy duty service. No order is too big or too small for Buckeye. Let us quote on your requirements.

Buckeye

BRASS AND MANUFACTURING COMPANY

BRONZESMITHS SINCE 1900

6412 HAWTHORNE AVE. CLEVELAND, OHIO

BRONZE SLEEVE BEARINGS · STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT IN ANY RECOGNIZED BEARING METAL ANALYSIS

LORD
SHEAR TYPE
Bonded Rubber
MOUNTINGS

absorb the punch of SHOCK and VIBRATION

IT doesn't have to be a direct hit to set walls crumbling. Uncontrolled vibration can do it. A soldier doesn't have to be wounded to be rendered unfit for duty. Shell-shock—vibration—can be quite as effective.

Uncontrolled vibration will shake your expensive machinery into junk and shake your best workers into a state of nervous inefficiency.

Proper application of the Lord plan of scientific analysis and control make it possible to reduce by 80% or more, the destructive forces of vibration.

Without obligation to you, Lord Engineers will make a study of vibration problems in your product, offering recommendations for its effective reduction and control.

For over twenty years Lord has been the pioneer in the science of vibration control. Lord Bonded Rubber Shear Type Mountings embody many exclusive techniques and patented features which cannot be copied.

Lord's special bonding process guarantees against failure of bond between rubber and metal. Lord's scientific mold design throws flexing action away from the metal parts into the rubber body, preventing stress concentration at the edge of the bond. Lord's carefully controlled compounding processes produce rubber of the exact degree of stiffness and other qualities required for the maximum efficiency on the job for which it is designed. Lord's bonding process leaves the rubber element in a state of rest, with no "built in" stresses of tension, compression, or torque, to detract from its full potential in combatting the forces of vibration.

IT TAKES **BONDED RUBBER** *In Shear* TO ABSORB VIBRATION

LORD MANUFACTURING COMPANY
ERIE, PENNSYLVANIA

SALES REPRESENTATIVES
NEW YORK - - 280 MADISON AVE.
CHICAGO - 520 N. MICHIGAN AVE.
DETROIT - - 7310 WOODWARD AVE.
BURBANK, CAL. - 245 E. OLIVE AVE.
CANADIAN REPRESENTATIVES
RAILWAY & POWER ENGINEERING CORP. LTD.
TORONTO, CANADA

Originators of Shear Type Bonded Rubber Mountings

COMPACTNESS
COMBINED WITH PRESSURE
BEARINGS: HYATT

The high speed—1,000 R.P.M.—high pressure—1,000 lbs. sq. in. pump built by The F. E. Myers & Bro. Co., Ashland, Ohio is equipped with:

Hyatt Hy-Load Bearings on pinion shaft and crank shaft—Hyatt Wound Roller Bearings (without races) on hardened and ground eccentric shafts

In designing the new Myers Orchard Sprayers, the engineers selected Hyatt Roller Bearings, not only for their precision and long-lived sturdiness but also, for their compactness, which permitted the packing of great power within a minimum of gear space.

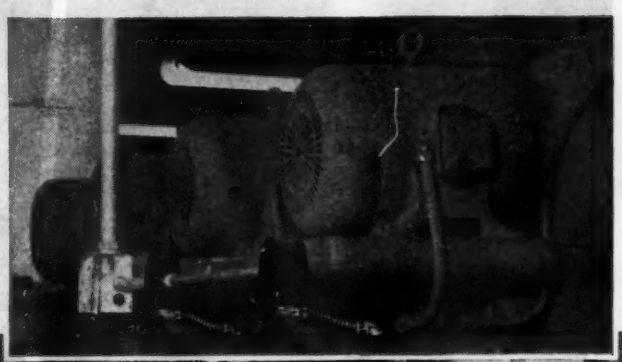
This is another example of Hyatt ability to provide bearings that meet exactly the machine designer's requirements. Hyatt engineers stand ready at any time to help you solve specific bearings problems.

HYATT BEARINGS DIVISION—GENERAL MOTORS CORPORATION
Harrison, New Jersey

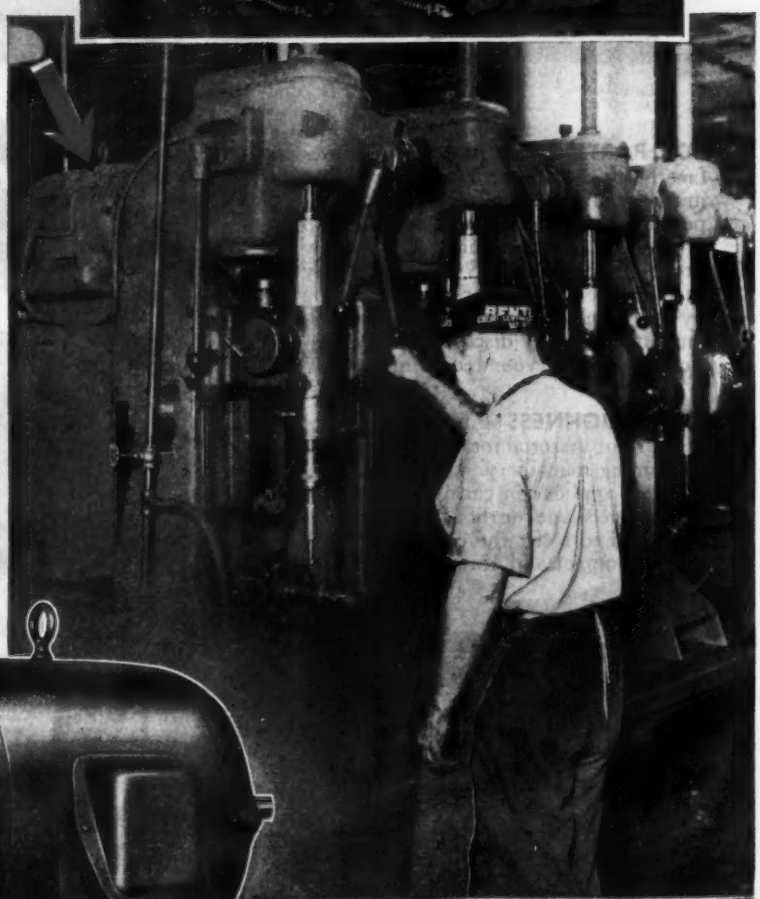
CENTURY TOTALLY ENCLOSED FAN COOLED MOTORS

Provide

Positive Protection Against Destructive Atmospheres



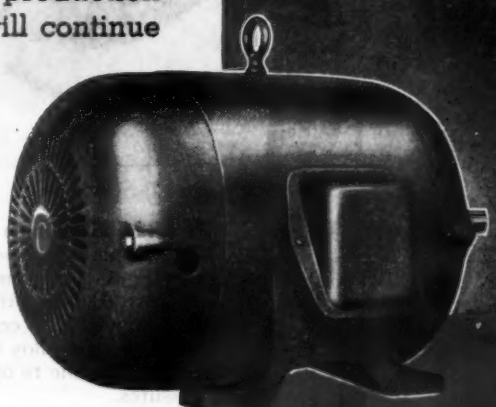
Metallic and abrasive dusts, metal cuttings, coolant mists, and other destructive atmospheres never reach the vital parts of a Century TEFC Motor.



The inner frame of Century TEFC Motors is sealed against the entrance of foreign matters. The windings and bearings are thus protected—and longer, more continuous operation is assured in destructive atmospheres.

The motor is kept cool by a fan, which forces air through large, smooth air passages between the inner and outer frames. These modern Century motors meet the demands of high-speed production that exists today and will continue after the war.

A Century engineer will gladly help you select the Century motor that best fits the load and the operating conditions surrounding your motor-driven machinery. Call him in.



Century C MOTORS

CENTURY ELECTRIC COMPANY

1806 Pine Street • St. Louis 3, Missouri

Offices and Stock Points in Principal Cities

401

FOR THE *Special* JOBS OF INDUSTRY

FOR PARTS that must have high surface hardness and wear resistance, that must retain hardness at elevated temperatures, that require high resistance to fatigue, a complete line of Nitralloy Steels (special U·S·S Carilloy Alloy Steels most suitable for case hardening by nitriding) is available. Our metallurgists will gladly discuss their application in terms of your requirements.

THE TOUGHNESS of alloy steel makes it the right material for the construction of forming machinery. The proper steel for each application can be designed to hold a true shape for thousands of operations and to resist the deteriorating effects of impact and abrasion.

OF THE TESTS which attempt to duplicate service condit high temperature operation, the long-time "creep" test most significant. The value of research work such as demonstrated in a striking way by the increased fuel ec being reported by central generating stations which, b of the stronger alloy steels now available for high temp service, are able to operate safely at higher temperatur pressures.

USS STEEL
UNITED STATES STEEL

...Electric Furnace Steels

★ **Special Heat-Resisting Steels**

★ **Aircraft Quality Alloy Steels**

★ **Bearing Steels . . . Nitralloy Steels**

IN ALL GRADES, IN ALL FINISHES, AND IN THE WIDEST RANGE OF SIZES

TO meet your present and future needs for these *quality* alloy steels, two completely integrated Electric Steel plants, one at Chicago and one at Pittsburgh, are ready to serve you.

Unequalled facilities for on-the-spot rolling, finishing and heat treating permit us to furnish electric furnace alloy blooms, billets and bars, slabs, plates, sheet and strip, as well as standard and special sections. Wide flexibility in furnace capacity makes it possible to handle, promptly, small orders as well as large.

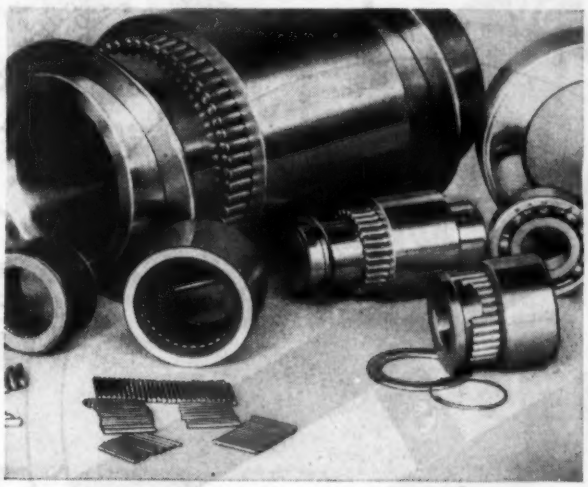
In these plants the fine art of steel making has been brought to new peaks of perfection. For not only are the men who control and operate them of thoroughly seasoned skill and experience, but they have at their service electric steel production equipment as fine, as complete and as modern as anywhere available.

The steels they produce reflect these facts. The close controls possible in the electric furnace assure consistently uniform response to heat treatment and to forging, machining and welding processes that can be readily translated into better performance of your end product.

CARNEGIE-ILLINOIS STEEL CORPORATION

Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*
United States Steel Export Company, New York



WHERE PRECISION is a "must," as with bearings and gears, the unvarying uniformity of U·S·S Carilloy Alloy Steels helps designers meet difficult performance standards. These steels are easy to forge, easy to machine, and respond consistently to annealing and heat treatment.

FRAMES, struts and actuating arms of this retractable landing gear are made almost entirely of special Aircraft Quality alloy steel forgings, that soak up tons of shock without weakening or giving way. On larger planes, hydraulic cylinders are shaped and welded from alloy steel plate.

UNITED STATES STEEL

Veeder-Root COUNTROL

gives a True & Constant Bearing on industrial production

Like a compass on a ship, a Veeder-Root Counting Device tells whether the machine it's installed on is holding to its set course in production, or whether it is veering off in quantity or speed.

One glance at the constantly changing figures in the counter-window, and your production men can tell whether that machine needs any adjustments in power input, mechanical function, or work-feed, to make sure that it completes its run on schedule.

That's how Veeder-Root Devices are helping to keep everything under *Count*rol in plants in every field of war production. And they can do the same for *you*, on machines and processes, whether they're electrically or mechanically operated. These devices can give you the production facts you need in any terms or units . . . strokes, turns, pieces, volumes, lengths, trips, etc. And they're inexpensive and easy to install, without interrupting production. Find out exactly how Veeder-Root *Count*rol can help you make every lick of work count for more.

The Counting House of Industry

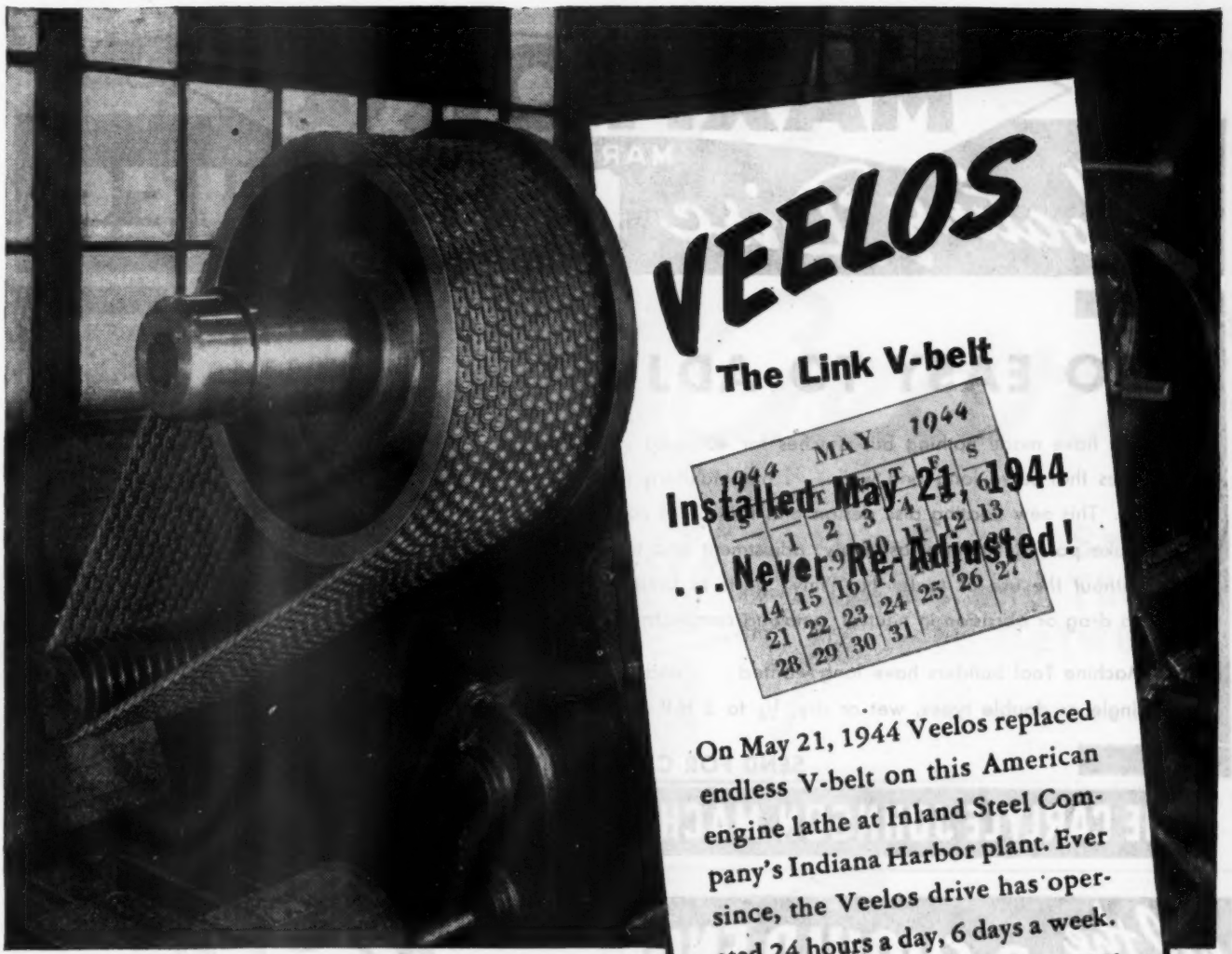
77204

VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., Montreal

In England: Veeder-Root Ltd. (New address on request)



VEELOS

The Link V-belt

Installed May 21, 1944
...Never Re-Adjusted!

On May 21, 1944 Veelos replaced endless V-belt on this American engine lathe at Inland Steel Company's Indiana Harbor plant. Ever since, the Veelos drive has operated 24 hours a day, 6 days a week. *Yet the Veelos belt has never once been re-adjusted.* That's a remarkable record!

Throughout Metalworking...
as In the Steel Industry...
Link Construction Ups Production

Link construction of Veelos turned the trick at Inland... and link construction makes Veelos the most adaptable of V-belts for any drive. Quick, easy tension adjustment ends slippage ...keeps machinery running at full speed and productivity.

One drive of Veelos will point the way to production increases and power savings throughout your plant. Write today for free Veelos manual giving complete details.

MANHEIM MANUFACTURING & BELTING CO.
MANHEIM, PENNSYLVANIA

Simple as Buttoning a Shirt

Get the "hang" of it, and you'll couple and uncouple Veelos as easily as you button your shirt. This unique, link construction is the big reason why *production goes up when Veelos goes on.*

VEELOS
THE LINK
V-BELT

Adjustable to any Length
Adaptable to any Drive

TRADE
MAXITORQ
MARK
Floating Disc CLUTCHES

SO EASY TO ADJUST

We have made nothing but clutches for 40 years . . . good ones that serve long and well . . . but Maxitorq tops them all. This new floating disc design and fool-proof construction make possible manual assembly, adjustment and take-down, *without the use of tools.* No "tiny" parts to break or lose; no drag or abrasion in neutral; amazing compactness.

DOUBLE TYPE CLUTCH

Machine Tool builders have long wanted . . . and needed . . . a clutch like Maxitorq. Now available in single or double types, wet or dry, 1/4 to 5 H.P. at 100 R.P.M.

SEND FOR CATALOG NO. A33

THE CARLYLE JOHNSON MACHINE COMPANY - MANCHESTER, CONNECTICUT

If the WAR SHOULD END Tomorrow

We would be most happy. Making every effort to increase vital production will bring an earlier peace.

GUSHER
COOLANT PUMPS

have proven a dependable aid in increasing the production of machine tools. Install Gusher Coolant Pumps on your bottle-neck machines NOW.

Shown here is our new model HL-15025-B.

Send for new catalogue showing complete line of models.

MODEL HL-15025-B

THE RUTHMAN MACHINERY CO.
1809 READING ROAD CINCINNATI 2, OHIO
The "GUSHER"—A Modern Pump for Modern Machine Tools

AL-LO
METAL SPINNING

exactly to your specifications

AL-LO offers long specialized experience and complete modern facilities for metal spinning of every description and design in all metals.
All work is finished to the closest limits of accuracy.
We also are equipped to handle work involving fine production welding and brazing.
Investigate spinning as the solution to your production problem.
Send your specifications—ask for our quotation.

This typical AL-LO produced part is made from a flat 1/8" sheet, formed into a tube, welded and then spun and drilled.

ALEX LOWENSTEIN
301 WATER ST. BINGHAMTON, N. Y.
"Production Metal Spinning Experts"

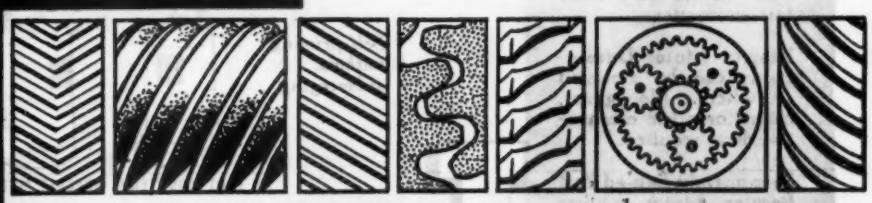
Brad Foote Gears

Large Gears, Small Gears and Those In Between

It's all the same at the ultra-modern Brad Foote Plant, where special precision-cut gears have been made for over a generation.

The extensive equipment of this plant permits the manufacture of unusually large amounts of smooth running quality precision-cut gears in all tooth forms from any practical material.

Brad Foote special cut gears have met the test and are doing their bit.



BRAD FOOTE GEAR WORKS

1309 S. CICERO AVENUE CICERO 50, ILLINOIS

Brad Foote Precision cut bevel gears

Higher Coolant Pumping Efficiency for Your Present Machine Tools . . . Peak Performance for Your Future Developments

the new improved line of Logan SURE-FLOW centrifugal pumps

Re-engineered from top to bottom to keep pace with today's advanced machine tools and methods

NOW AVAILABLE FOR IMMEDIATE DELIVERY—the new 1945 line of Logan *Sure-Flow* Centrifugal Pumps . . . embodying exclusive new features and Logan engineering developments that keep pace with fast-cutting, high precision war production machine tools and methods.

For many years, *Sure-Flow* Pumps have given outstanding service in coolant and other pumping duties. Now this excellent pump is superseded by an even superior line, re-engineered from top to bottom to set new high standards of pump efficiency and long, trouble-free life in a wide range of applications.

Positive fluid displacement and rapid discharging of trapped vapor are provided by the new Logan impeller design. The enclosed, permanently sealed ball bearing motor simplifies maintenance. In addition to coolant pumps, the line now includes high-speed models for driving stream, deep hole drilling and chip flushing applications. New grinder and submerged type pumps are now available. Foot mounted and bracket mounted pumps are *self-priming without submerging.*

For complete information and specifications on Logan *Sure-Flow* Centrifugal Pumps, write for the new free catalog illustrated below, or call on Logan engineers for recommendations on applying *Sure-Flow* Centrifugal Pumps to your work. There is no obligation.

* *Self-priming without submerging.*

FOOT MOUNTED* | BRACKET MOUNTED* | FLANGE MOUNTED (intake thru flange) | GRINDER TYPE (intake thru flange) | SUBMERGED TYPE

Logan

Air and Hydraulic Equipment

ARMY-E-NAVY

LOGANSPORT MACHINE CO., INC.

918 PAYSON RD.
LOGANSPORT
INDIANA

CHUCKS • CYLINDERS • VALVES • PRESSES • SURE FLOW COOLANT PUMPS

NEW FREE CATALOG

Get complete specifications, drawings and performance curves on the new *Sure-Flow* Pumps . . . write for Catalog 62. Includes motor sizes and speeds, typical applications, method of determining required pump capacity and valuable engineering data.

ONE WAY TO FREE A PHONE FOR A FIGHTER . . .

When you need STAINLESS STEELS

CALL Industrial and the probability is your complete order for stainless steels will be handled promptly. You'll not be faced with the necessity of making a half-dozen long distance calls to various Stainless suppliers.

Industrial's inventory—everything in stainless steels, from sheets and bars through tubing and wire, to valves, fittings and even bolts and nuts—is the largest, most diversified warehouse stock of Stainless in America!

Whatever your specification or fabrication problem, Industrial's highly trained metallurgists will assist you. *Even today, Industrial works fast, with same-day attention to orders.*

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Place the entire order with Industrial. If it's Stainless, we have it. Industrial Steels, Inc., 250 Bent Street, Cambridge 41, Mass.

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INDUSTRIAL STEELS, INC.

Yes, it's true!

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ARE MODERNLY DESIGNED

Gerotor Model 10 Double-Acting, Rotating Air Cylinder

FEATURES

- ★ COMPACT DESIGN
- ★ SELF-SEALING PACKINGS
- ★ RUST-RESISTANT
- ★ WITH OR WITHOUT CUSHION
- ★ NO TIE RODS
- ★ DESIGNED FOR 150# AIR SERVICE
- ★ BALL-BEARING AIR SHAFT ASSEMBLY USED ON ROTATING CYLINDERS

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8 MODELS
12 DIAMETERS
ANY STROKE

Gerotor Model 111 Double-Acting; Non-Rotating Air Cylinder

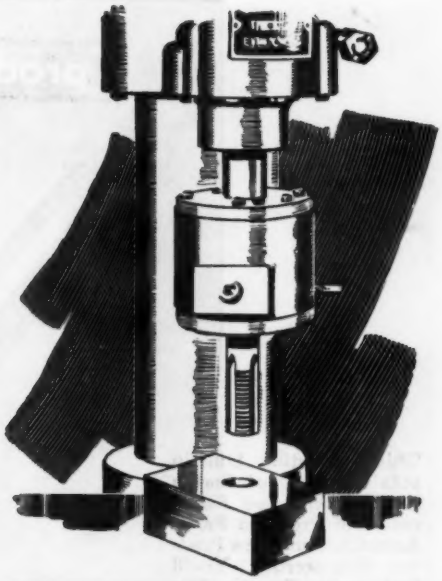
GEROTOR
AIR AND HYDRAULIC DEVICES

LOGANSPORT, INDIANA

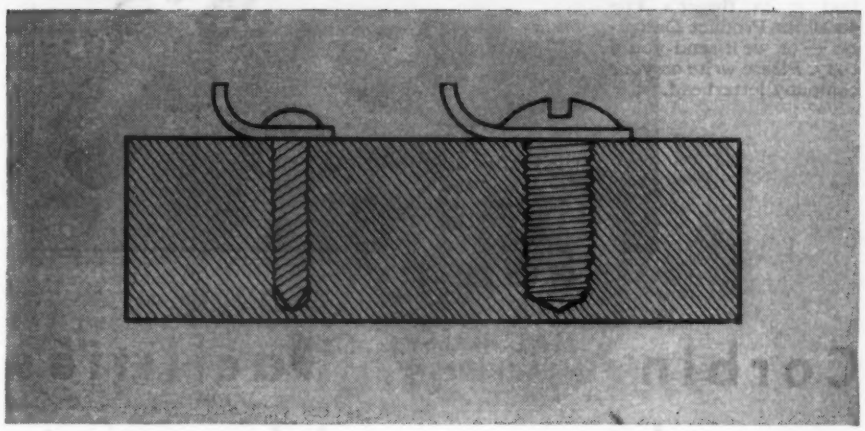
GEROTOR MAY CORPORATION • PLANTS—BALTIMORE, MARYLAND • LOGANSPORT, INDIANA

MACHINING DATA ON PLASTICS

3. TAPPING



This is the third in a series of messages designed to better your knowledge about the machining of molded phenolics—the most versatile of all plastics . . . the type of plastics which Durez has specialized in producing during the past quarter century.



Molded Durez phenolics can be drilled and tapped without difficulty, or, if the strain is light, holes can be molded-in, and drive screws used.

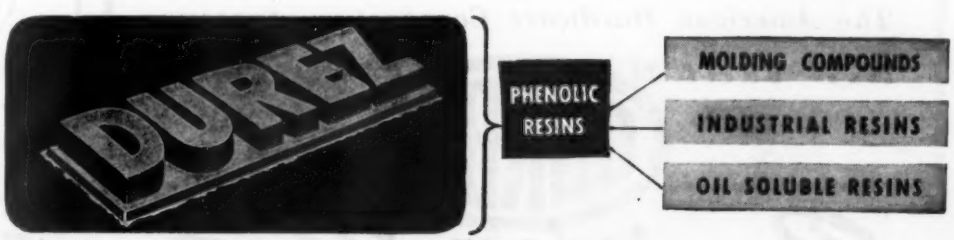
Tapping of phenolic plastics is recommended only when it is less expensive than molding-in a threaded insert, unscrewing a threaded pin, or in instances where certain design limitations make it impractical to mold the thread.

For long production runs a high-speed nitrated and chrome-plated tap having three flutes rather than the four commonly used is recommended. A negative rate of about 5 degrees on the front face of land and ample clearance are necessary to insure accurate cutting and to prevent binding and chipping when backing out. It is a general practice to use an oversize tap to the maximum allowable size. This will produce more parts per tap before the tap wears down to the minimum size. From 65 to 75% of thread depth should be used. This practice allows more chip clearance and less binding.

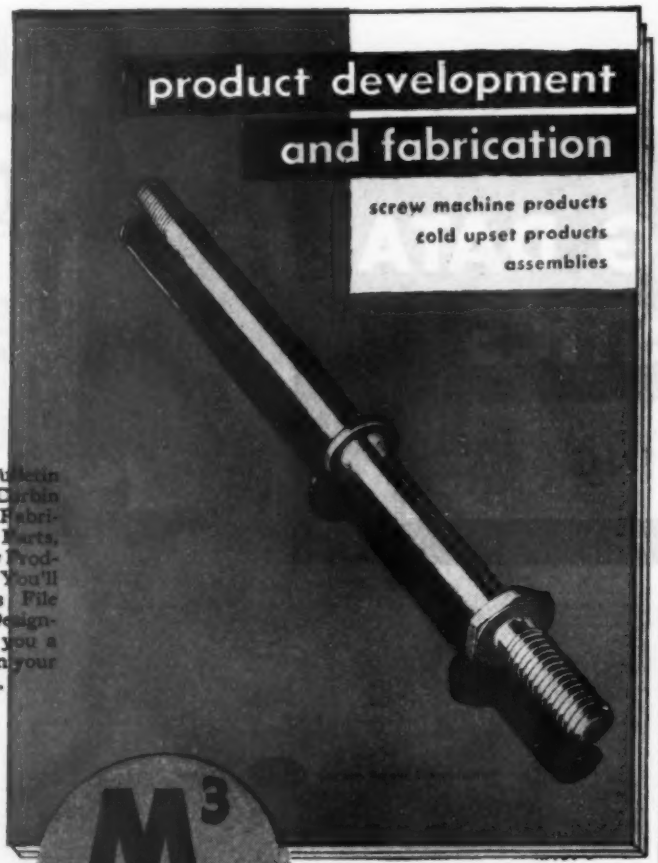
Up to ¼" diameter, the peripheral speed for tapping phenolic molding material should be from 50 to 80 feet per minute. (Larger than ¼" taps are impractical in phenolic parts.) Air blasts concentrated on the tap, operated if possible by the stroke of the tapping head, will help to clear the chips and act as a cooling agent, minimizing friction and overheating, prolonging the life of the tap and resulting in greater production per tap.

Excellent machinability is one of the many outstanding properties of Durez phenolics. A few others are: diversity of finishes, dielectric strength, and resistance to heat, moisture, acids and alkalies.

Durez technicians are backed by a quarter century's experience of active participation in the successful development of many and varied products. This is on a scope that includes practically all industry. The benefits of this unusual experience and the wealth of data in our files are available, at all times, towards furthering your progress in the machining of phenolic plastics. Durez Plastics & Chemicals, Inc., 533 Walck Road, North Tonawanda, N. Y.



PLASTICS THAT FIT THE JOB



This interesting bulletin tells the story of Corbin Development and Fabrication of Precision Parts, Assemblies and New Product Engineering. You'll find it in Sweet's File 4m10 for Product Designers — or we'll send you a copy. Please write on your company letterhead.

M³ MEN MATERIALS MACHINES

Corbin facilities mean better precision parts

. . . better than ordinary screw machine parts! Because here at Corbin we don't have to *start* or *stop* with the Screw Machines. Corbin M³ facilities include batteries of headers, grinders, thread rollers, millers . . . in addition to hundreds of automatics. Corbin's men, materials and machines mean *full* fabrication, modern scheduling control . . . assuring economy, rapid production, full inspection — and any quantity desired.

Corbin welcomes the opportunity to work with manufacturers in the design and development of Precision Parts — and offers its M³ facilities to insure high standard accuracy and dependability. P-8

THE CORBIN SCREW CORPORATION
The American Hardware Corporation, Successor
NEW BRITAIN CONNECTICUT

CORBIN

See Sweet's Product Design Catalog, outline of Corbin Products and Facilities

Precision Parts

Because *wide-awake* inspectors at Corbin remove the culls and duds, and make sure that every Corbin Screw you receive is uniformly O K . . .

⊕ **CORBIN-PHILLIPS Recessed Heads**

⊖ **REGULAR SLOTTED Heads with Saw-cut Slots**

always correct in size and shape and centered accurately. These uniform features make for quick and easy driving. You'll save time when you use Corbin Screws. *And time is money!*

Look to CORBIN

for your requirements in Screws and Nuts . . . a full range in both CORBIN-PHILLIPS and Regular Slotted. Also AIRCRAFT Screws and Nuts to Governmental specifications.

See your Distributor

—also complete stocks at Chicago, New York and New Britain . . . and sales representatives who can "talk shop."

S-12

M³ MEN MATERIALS MACHINES **facilities**

that have made Corbin Headquarters for Precision Parts are producing highest quality Screws . Nuts . Chain.

Look to Corbin for

Standard Parts

Checking of mating gears on centers is but one of many procedures followed by Sier-Bath in the production of precision gears. The constant application of modern inspection methods is assurance that every gear that leaves the Sier-Bath plant is exactly to specifications and will meet assembly and preformance requirements without delay or difficulty. Sier-Bath precision is a by-word among gear users, and is inherent in Sier-Bath gear service.

Early shipments can be made on gears from 2" to 52" diameter. Send your specifications and ask us to quote.

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9254 HUDSON BOULEVARD — NORTH BERGEN, N. J.

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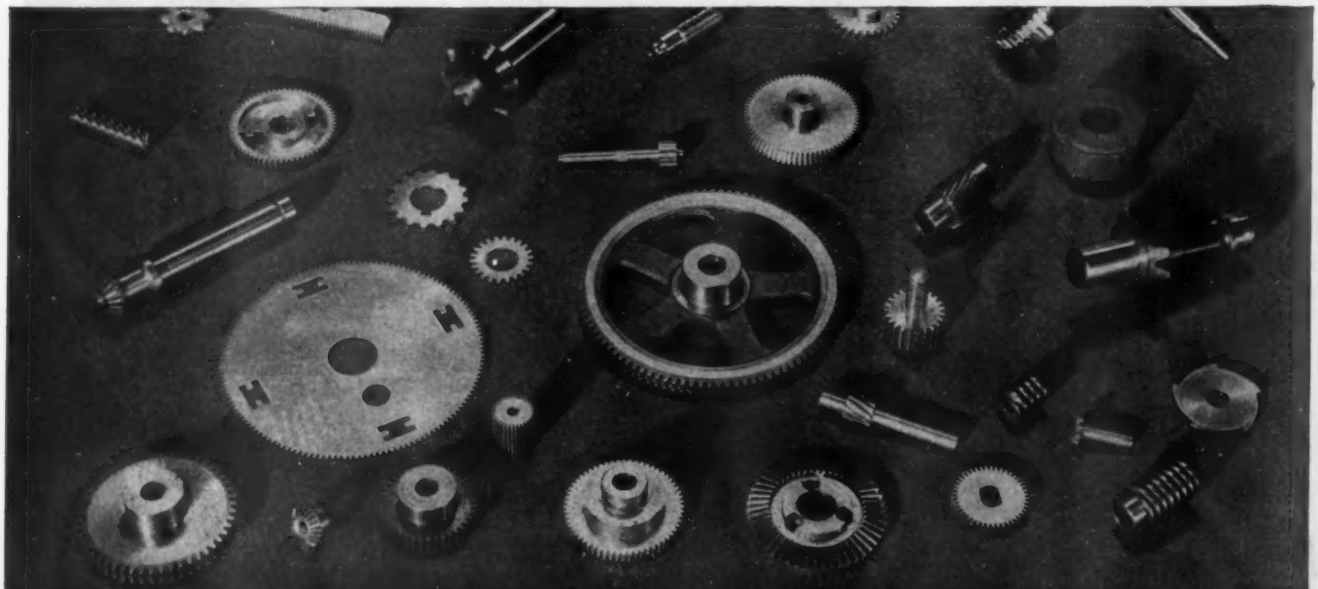
The Doorway to 38 years experience in making Precision Gears

Quaker City Gears Are Rolling with the Armed Forces on All Fronts



QUAKER CITY GEAR WORKS 1910-32 N. FRONT ST. PHILADELPHIA, PA.

Cincinnati GEARS THAT FIT THE JOB

We of the Cincinnati Gear Company believe our responsibility to industry goes beyond the production of ***Gears, Good Gears Only.*** The ultimate use of these gears is equally important to us.

Putting the ***right*** gear in the ***right*** place in the ***right*** way is not a one-man job. It calls for that combination of skills found only in manufacturer and designer plus materials. Experience proves that this team, working together, leads directly to success in good gear usage.

- ★ SPUR
- ★ BEVEL
- ★ HELICAL
- ★ SPLINE
- ★ WORM
- ★ SPECIAL

THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
Wooster Pike and Mariemont Ave. ★ Cincinnati 27, Ohio

SMALL GEARS

SPURS • HELICALS • BEVELS
(Straight & Spiral)
WORM GEARING • THREAD GRINDING
(14 to 96 D. P.)

As manufacturers of high precision small gears for numerous vital controls used in this highly mechanized war, we are literally 'swamped'.

Therefore, under existing conditions, we are forced to minimize further commitments unless they have W.P.B. urgency support.

Gear Specialties
MANUFACTURERS
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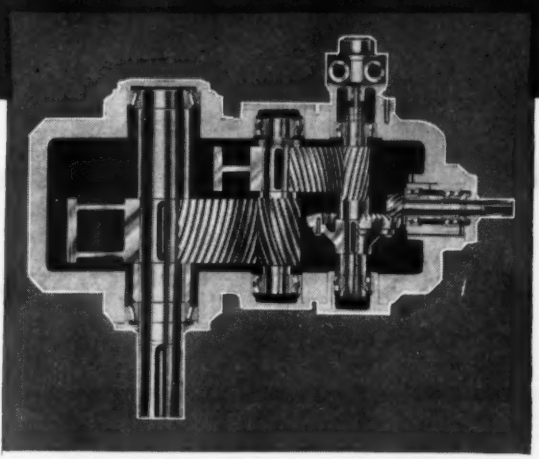
a HIGH EFFICIENCY RIGHT ANGLE DRIVE . . .

Spiral-Bevel Speed Reducers

These units provide a dependable means of transmitting power at right angles, either horizontally or vertically. They're made in single, double and triple reductions with standard ratios ranging from 1.5 to 1 up to 238 to 1. The single reduction units employ only spiral bevel gears, while in the double and triple reduction types helical gears are used for the second and third reductions.

An outstanding advantage of Philadelphia Spiral Bevel Reducers is the high efficiency rating, for example, the single reduction unit is approximately 98% efficient. That means all but 2% of the input power is transmitted to the low speed shafts . . . thus often smaller frame size motors can be used with spiral bevel units than with other comparable types of reducers.

Our Bulletin 200 gives further details . . . a copy will be gladly sent in reply to a request on your business letterhead.



In the blue panel above is shown a Size 3515 Type BLT Double Reduction Spiral Bevel Helical unit. The lower illustration is a sectional view of a Triple Horizontal Unit, Size 3600 Type BLT.

Philadelphia Spiral Bevel units are performing satisfactorily in many types of service.

ARMY E NAVY

Philadelphia GEAR WORKS INCORPORATED

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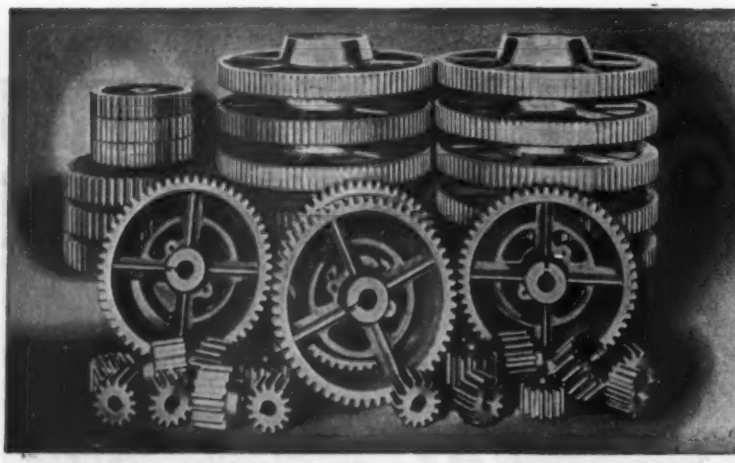
Industrial Gears and Speed Reducers
LimiTorque Valve Controls



ADAMS GEARS

SPUR — HELICAL — WORM
BEVEL — MITER — RACKS

Splined Shafts A Specialty

THE ADAMS COMPANY
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"64 YEARS" MANUFACTURING GEARS

Despite the continued growth of our gear business we are still in position to give each customer the attention they have a right to expect.

We carry a complete stock of standard cut gears and can furnish special gears to your specifications.

GRANT GEAR WORKS
BOSTON, MASS.
ESTABLISHED 1877 BY GEO. B. GRANT

GEARS TO ORDER

Spiral and helical gears; special couplings, bushings and collars; pins, pulleys and rollers. Made to your specifications—*promptly.*

KELLEY GEAR & TOOL CO.
Bristol, Tennessee

MP

QUALITY GEARS CUT TO ORDER

● MEISEL produces but one *kind* of gears . . . gears constructed for specific jobs. Only through the inherent accuracy of this special designing could such dependability, performance and economy be possible. Tell us what you expect it to do, and we'll show you the *one* gear suited for your job.

MEISEL PRESS MFG. CO.
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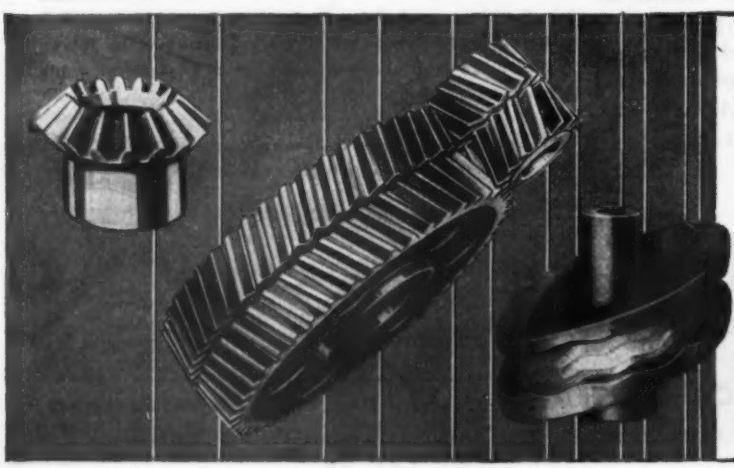

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Send blue prints or samples for estimate. Accuracy of work guaranteed to your specifications.

THE HARTFORD SPECIAL MACHINERY COMPANY
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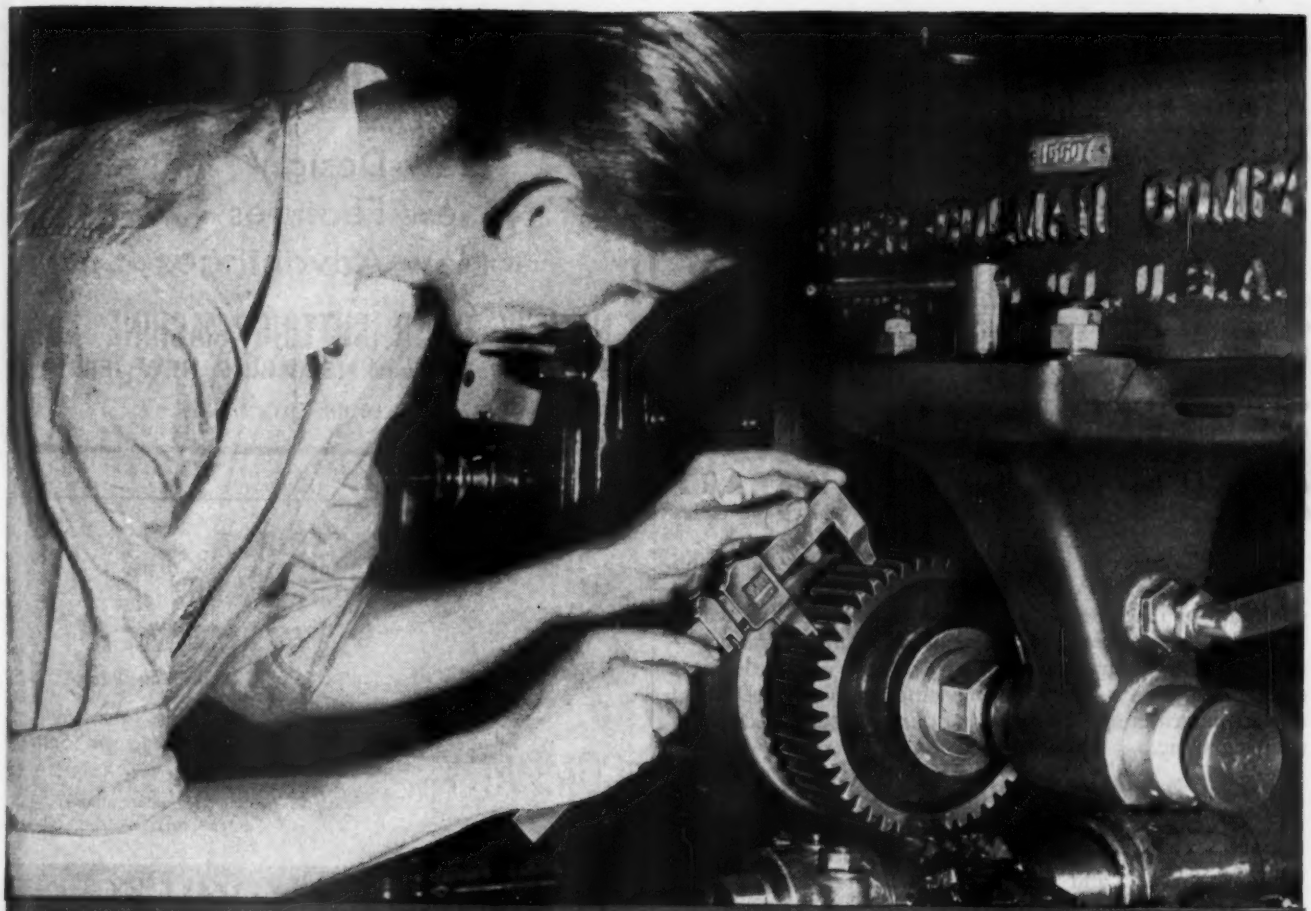

Progress inspection—checking accuracy of tooth spacing and clearance on a spur gear.

Do Gears Have a Personality?

Probably not, but they do reflect the personality of their maker. They can be cast to order, however complex they may be, if the order-taker is competent and experienced. They can be doubly inspected—checked in the machine shop and again before shipping. They can be made under the inflexible supervision of "old timers." They can show a lot of finishing touches that show the maker really cares.

We strive to have our gears reflect the personality of such an organization.

The Illinois Gear trademark on every gear you buy means it's a "Five Star Gear". ★ The material has been carefully double-checked. ★ The gear has been cut by a highly skilled craftsman. ★ Required accuracy has been inbuilt. ★ The gear has been double-inspected after completion. ★ Delivery is as promised.

May we send Catalog 39 showing many types of gears, our production facilities and giving helpful engineering data?

ILLINOIS GEAR & MACHINE CO., Chicago (35), Ill.

ILLINOIS GEARS

ARMY ★ E ★★ NAVY

The mark on Finer Gears

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The set of books that makes

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and leads to bigger pay!

This big home-study and reference course gives you the practical facts on machines and methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency with

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—practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work

—training in the various operations performed in drilling and surfacing materials in the machine shop

—exact, descriptive data on all aspects of gear-cutting practice, useful in shops of any size

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Right in the Lead

THE GEOMETRIC TOOL CO.
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BILGRAM BEVEL GEARS

Straight — Spiral Teeth

ALL TYPES
ALL MATERIALS

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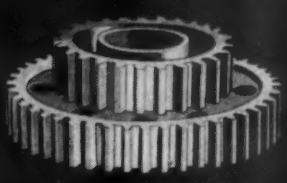
Better POWER TRANSMISSION for TOMORROW'S MACHINES!

A new era in the transmission of power is promised American industry after the war. Today, on the production lines and in the experimental laboratories of Foote Bros. are new developments that mark a major advance in the economical transmission of power. These developments include:

- *Aircraft gears produced in amazing quantities to power the giant Pratt-Whitney engines.*
- *"A-Q" (aircraft-quality) gears for other applications requiring high speed, light weight or greater efficiency.*
- *Hardened and ground parts for a multitude of uses where precision is important.*
- *Speed reducers of revolutionary design in a range of sizes, ratios and types to meet every need.*
- *Aircraft devices, precision built, embodying the characteristics of light weight and sturdy reliability.*

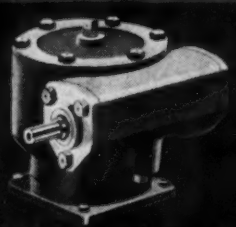
No matter what your requirements in the needs for power transmission equipment, Foote Bros. can aid you. Why not call on the engineers of one of America's largest and oldest makers of gears, speed reducers and transmission drives to help solve your problems?

FOOTE BROS. GEAR AND MACHINE CORPORATION
Dept. E, 5225 S. Western Boulevard • Chicago 9, Illinois

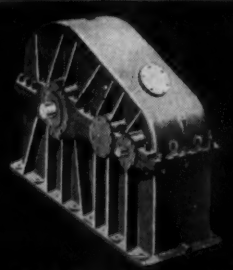


"A-Q" gears produced today for the exacting demands of aircraft engines will assure greater efficiency in machines planned for postwar.

Actuators—small packages of power—that simplify the handling of modern airplanes may have an application to your postwar plans.



Foote Bros. produces compact reduction units to meet special applications. This unit was designed for use with radar equipment.



This giant speed reducer 6 feet high is from the complete Foote Bros. line which includes a wide range of sizes and ratios to meet every application.

FOOTE BROS.

Better Power Transmission Through Better Gears

A copy of this informative product engineering manual on "A-Q" gears will be sent to you on request when it is ready.

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DETROIT DIE SETS ★

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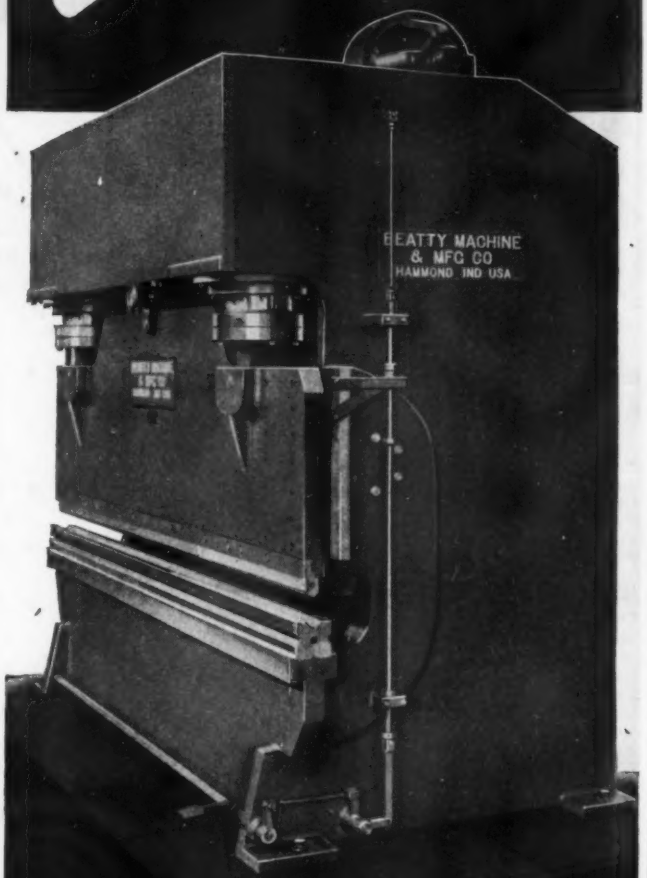
MODERN DESIGN

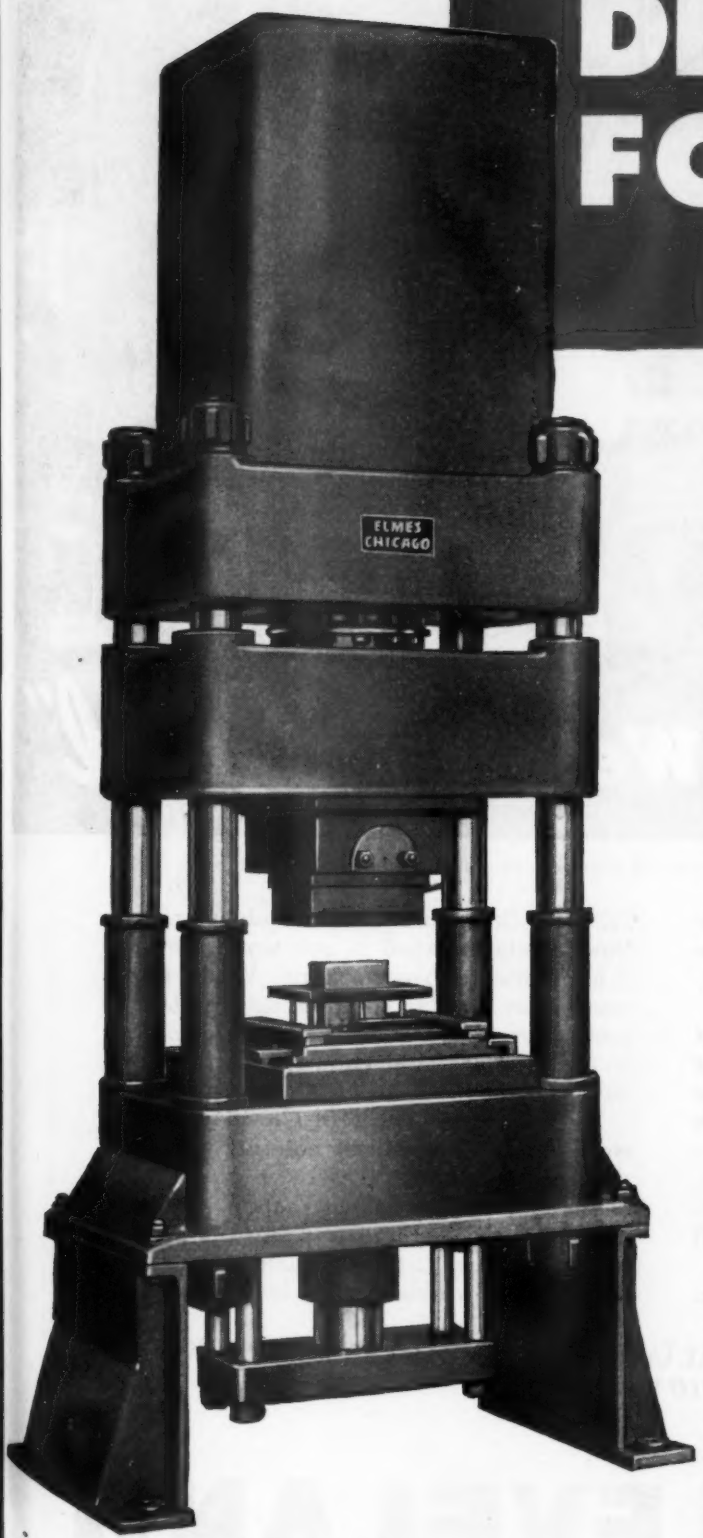


● The modern contour of this new BEATTY Heavy Metal Working Press reflects its equally advanced engineering. The finer performance of BEATTY equipment is proof that two heads are better than one, for every BEATTY machine combines the thoughts of a BEATTY engineer and a fabricator with a problem. Each machine is custom-built for the job to be done. And here's an invitation: Bring your next heavy metal working problem to us; perhaps we have solved many similar problems.

HYDRAULIC HEAVY METAL WORKING EQUIPMENT

BEATTY MACHINE & MFG. COMPANY HAMMOND INDIANA

Presses for DRAWING, FORMING Metals



Drawing and forming metal is an *ideal* application for the Elmes hydraulic press. Full power can be exerted at *any* point in the stroke—an especially important feature in starting deep draws. Slide speed may be varied at will for maximum production without tearing blanks—and *without damage to dies.*

Useless movement is eliminated. All Elmes hydraulic presses have Stroke Control to restrict slide travel. This saves time, speeds output. Rapid traverse to and from work saves seconds, minutes, *hours.*

Single-action presses for shallow draws, as well as deep-draw, double-action designs with separate hydraulically powered blankholders, can be furnished with manual, semi-automatic, or full-automatic control. Drawing pressure, and the interval of dwell upon the work, are variable with needs.

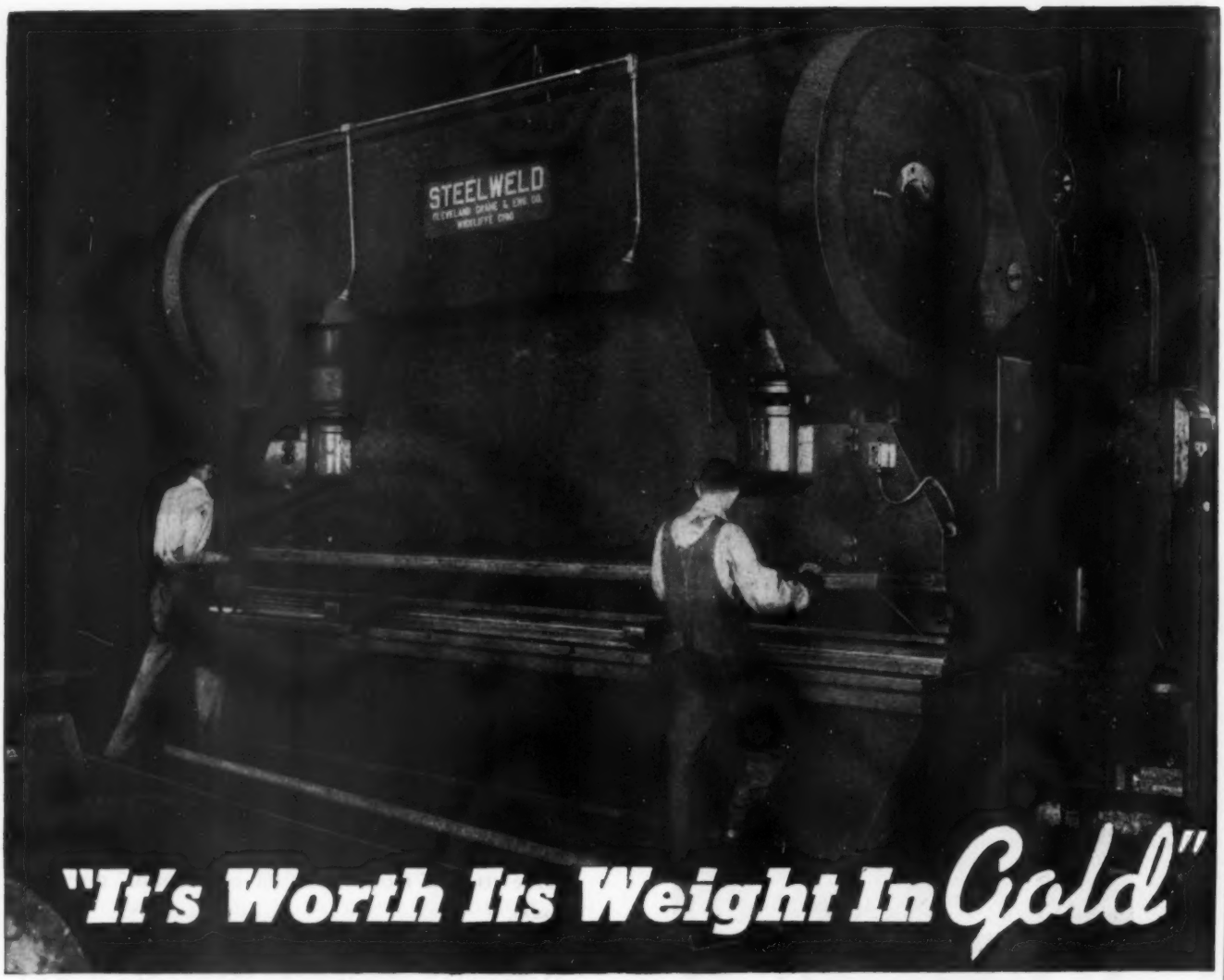
Hydraulic pressure is an irresistible force which Elmes simplified controls make fast, accurate, *instantly responsive.* Send for Bulletin 1010A "Hydraulic Presses for Drawing, Forming Metal."

ELMES HYDRAULIC EQUIPMENT

Single-action Elmes column-type drawing and forming press with hydro-pneumatic draw cushion in press bed—Model No. 4716. Elmes draw cushions can be furnished on either single or double-action presses to approximate or supplement blankholder functions. Shop air pressure is not required after charging at time of installation.

ELMES ENGINEERING WORKS OF AMERICAN STEEL FOUNDRIES, 1001-1013 Fulton St., Chicago 7, Ill.
Also Manufactured in Canada

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES



"It's Worth Its Weight In Gold"

Model M6-12 Cleveland Steelweld forming scow channels of plate 3/8" x 14'-6"

"Our big Steelweld Press is worth its weight in gold these days", writes the vice president of Rotary Lift Company, Memphis, Tenn.

It's during trying periods like the present that Cleveland Steelwelds are worth a great deal to their owners everywhere. Because they are extremely versatile tools that can be adapted to a wide variety of jobs, it is easy to switch them from one type of work to another. Peace-time work this morning, war productions this afternoon or vice versa, it is all readily accomplished.

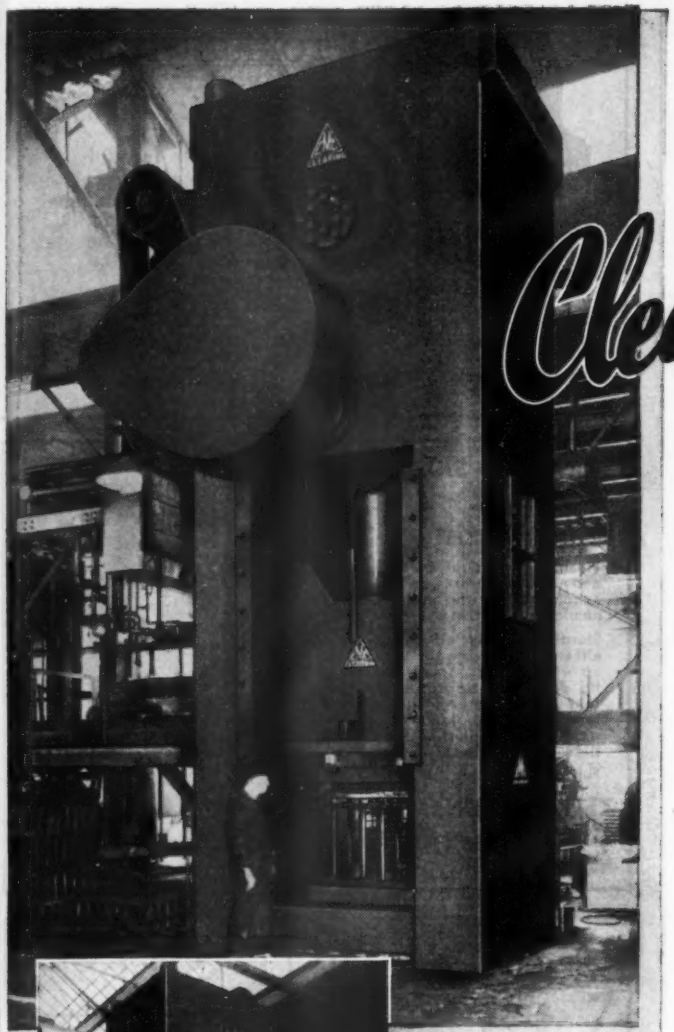
Rotary Lift purchased their Steelweld in 1936 for the manufacture of elevator cars. Now, busily engaged in war work, they use it for fabricating barge parts. When peace comes they hope to be again using it for the production of hydraulic elevating devices for which they are well known throughout the land.

The great advantage of Cleveland Steelweld Presses is that they not only will bend and form plate but that by a quick, easy change of dies, they will handle drawing, corrugating, punching and beading operations with equal dispatch. Plate up to 20'-0" long can be worked on the large machines.

GET THIS BOOK!
CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1127 EAST 283RD ST. WICKLIFFE, OHIO.

CLEVELAND
STEELWELD PRESSES
BENDING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING



Above: Capacity of this Clearing Single Action Mechanical Press is 1,000 tons. It has a 60" x 62" bed area and operates at 18 strokes per minute.

Above: Having a bed area of 30" x 36" and a 150 ton capacity, this Clearing Single Action press delivers 35 strokes per minute.

Right: With a 12" stroke and 600 ton capacity, this Clearing press makes 10 strokes per minute.

Clearing Presses

FIT INTO THE PICTURE

The Clearing Presses shown here were able to fill the gaps in production lines because Clearing makes doubly sure that each press fits the job. Hundreds of other installations of Clearing presses on vital jobs have been made for the same important reason.

Instead of asking you to settle for a stock model press only with the capacity you require, Clearing asks these two questions. What operation do you want the press to perform? What rate of production do you require? Then from all possible ways of supplying your need, Clearing engineers choose the one way that will do your job best on both counts. The skill and experience Clearing has gained on so many heretofore "impossible" press-building jobs make that press almost invariably one with shorter work cycles, producing fewer rejects with reduced inspection time and easier to operate.

Get the advantages of presses that fit into your picture . . . consult Clearing now concerning your immediate or future needs.

CLEARING MACHINE CORPORATION
6499 West 65th Street ★ Chicago 38, Illinois

ARMY E NAVY

CLEARING ★

MECHANICAL AND HYDRAULIC PRESSES
FOR SUCH OPERATIONS AS DRAWING + BLANKING + FORMING + FORGING

As you reconvert, assure LOWEST STAMPING COSTS with H & W Dieing Machines

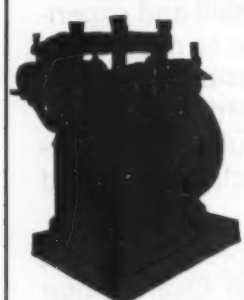
War's urgency has introduced the Dieing Machine to many firms who now know its amazing low-cost possibilities. In YOUR post-war planning, take advantage of this tried and tested way to turn out stampings faster, better, cheaper. Based on unique principles—foremost among which are Indirect Underdrive and Precision-Guiding of upper crosshead—this drastically different automatic press operates on a standard of smoothness and accuracy previously unknown. Using progressive dies and full automatic feed, intricate stampings are produced COMPLETE PER STROKE at speeds up to 600 strokes per minute. Precision of product readily controllable within .0002" limits. Accuracy of operation adds 600% to 1200% to what was previously considered good average die life.

The firm running Dieing Machines is truly in an enviable competitive position. Let our engineers look over your work and make suggestions.

REQUEST CATALOG 45

Can opener blade, requiring operations including sunken lettering and beveled blade, produced complete per stroke on Dieing Machine at greatly increased rate.

Airplane strut seat of .051" brass produced complete one per stroke at new high rate.



50-TON DIEING MACHINE
Other capacities: 10 tons to 300 tons

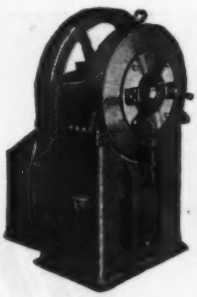
Pole piece for Diesel engine commutator assembly produced complete one per stroke, 120 per minute.

THE HENRY & WRIGHT MFG. CO.

487 Windsor St. Hartford 1, Conn.

Henry & Wright

AUTOMATIC MACHINERY
DESIGNERS & BUILDERS



THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

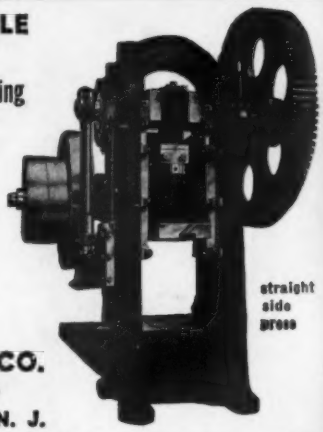
The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn.

STRAIGHT SIDE SINGLE CRANK PRESSES
for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.



straight side press

ZEH & HAHNEMANN CO.
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STANDARDIZED DIE SETS

BETTER-MADE
DIE SETS
AT LOWER COST

46 Styles—195,000 Sizes

E. A. BAUMBACH MFG. CO.
Machined Steel Semi-Steel
Send for our new catalog
1812 South Kilbourn Ave., Chicago, Ill.

Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

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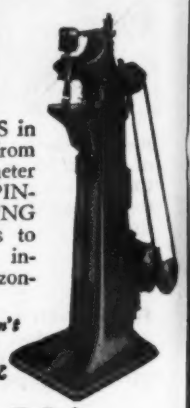
Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

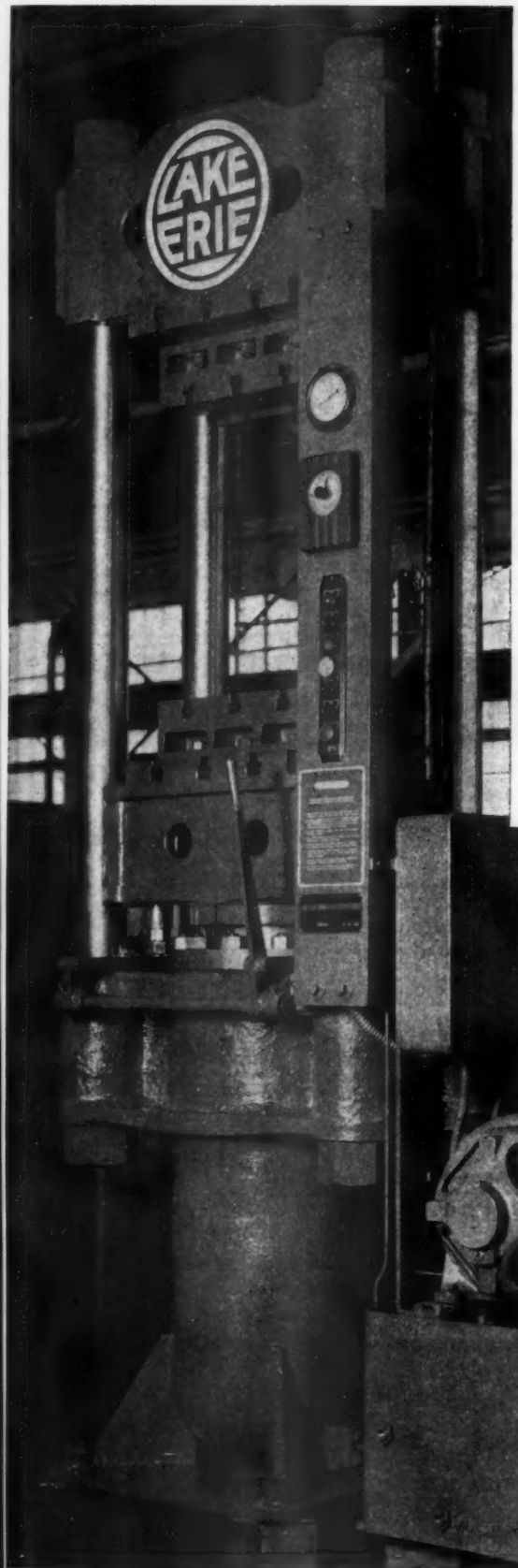
GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to 5/8" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

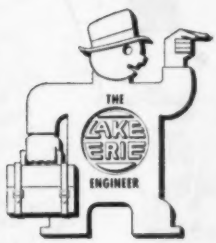
Write for literature and don't forget to send samples.



THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.



PILOTING THE FUTURE OF PLASTICS



This 200-ton Lake Erie Plastic Molding Press was built for the Durez Plastics & Chemicals, Inc., of North Tonawanda, N. Y.

It is used in the Durez Pilot Laboratory to experiment with and test out the many products, present and future, which can be manufactured more efficiently and more economically out of Durez Molding Compounds.

Lake Erie has its eyes focused on the great future of the Plastics Age. Already we have designed standard compression molding presses that can be adapted to your needs—or we can build presses to meet any special production methods you may require. Write for complete information.

LAKE ERIE ENGINEERING CORP.
507 Kenmore Station, Buffalo 17, N.Y.

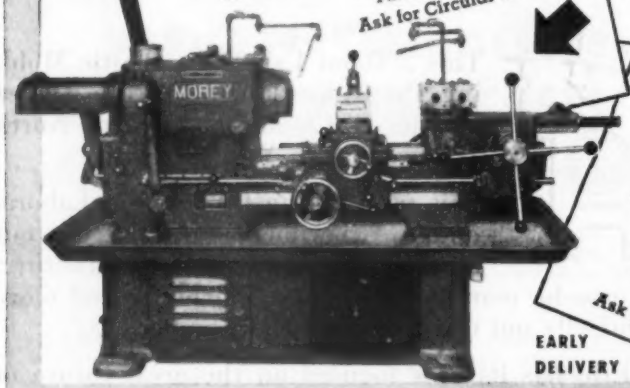
MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A

2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
Ask for Circular 629A

4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 736A

EARLY DELIVERY



INFINITE SPINDLE SPEEDS —Electrically Selected—

DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).

GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.

SPINDLE MOUNTED ON TIMKEN BEARINGS.

RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WILL WITHSTAND.

SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

DESIGNED AND BUILT BY
MOREY MACHINERY CO., INC
410 BROOME STREET, NEW YORK 13, N. Y.
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

DANLY PRECISION DOWEL PINS
STANDARD AND .001 OVERSIZE

Hardened and Precision ground to a tolerance of ±.0001 of an inch. Available in .001 oversize for repair or renewal work.

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PRODUCTION ENGINEERS
at these Branch Offices will help you with your
DRILLING PROBLEMS.

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LELAND GIFFORD
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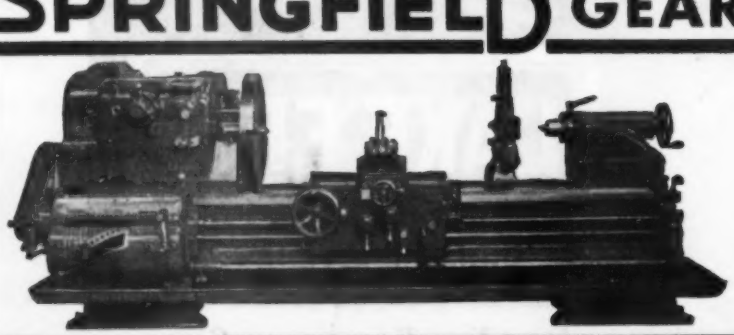
SPRINGFIELD GEARED HEAD LATHES

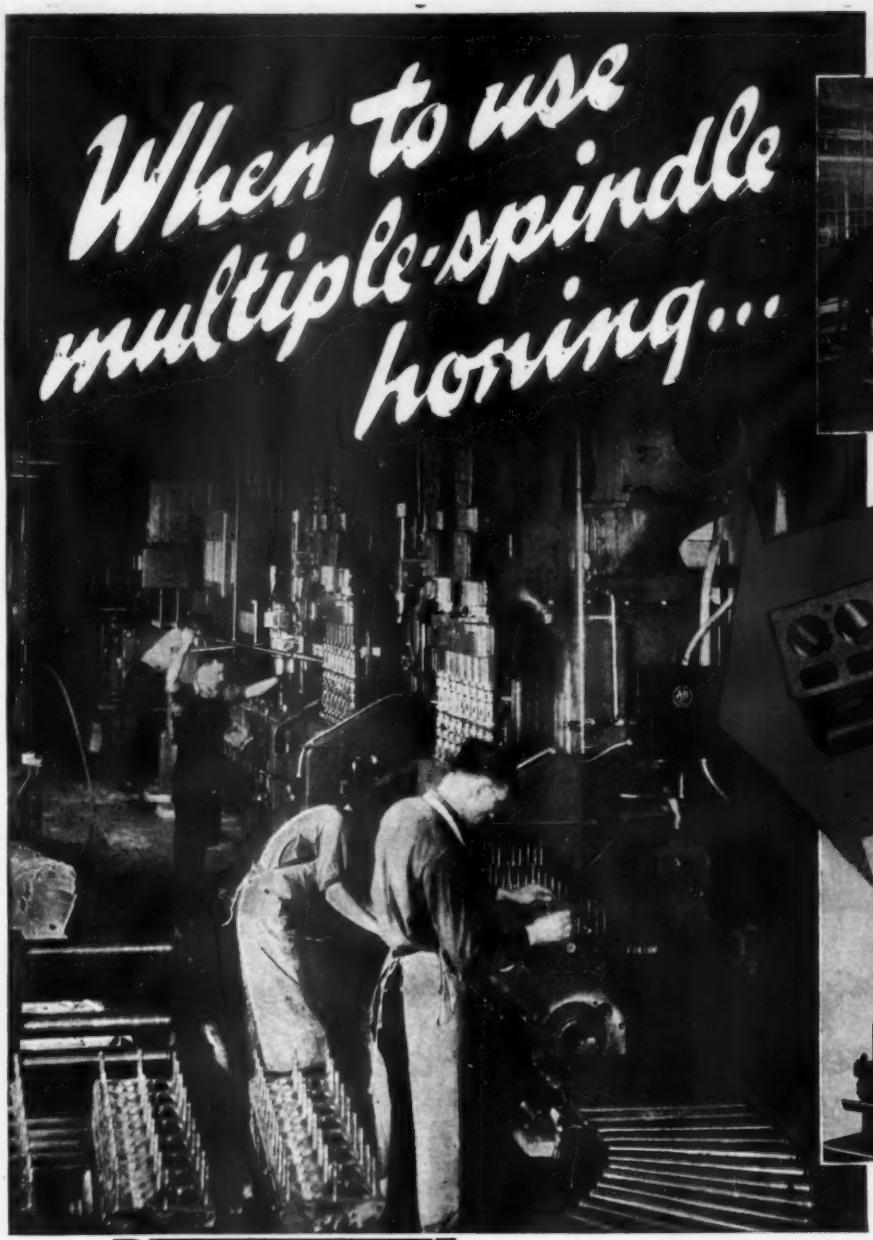


for peacetime or war production!

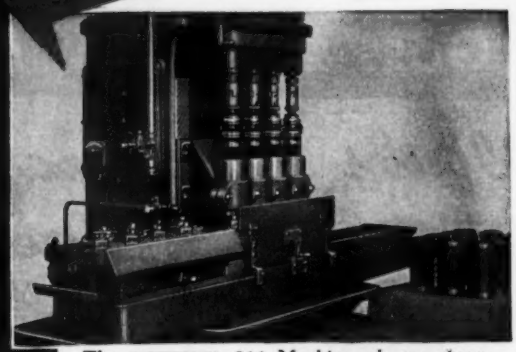
A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes—flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

When to use multiple-spindle honing...



(Below) *This battery of* BARNESDRIL *Single Spindle Machines on aircraft cylinder assembly line hones nitrided barrels (Hardness 65 Rockwell "C") to limits of .0005" and finished to 2.5 micro-inches.*



The BARNESDRIL *214 Machine, shown above, gives multiple honing advantages to individual parts. Special holding fixture has spare station which is reloaded during honing time.*

BARNESDRIL ENGINEERS WILL FIND THE ANSWER IN YOUR PART DESIGN AND PRODUCTION REQUIREMENTS

The design of your part and your production requirements determine whether or not multiple honing is the most practical solution to your internal finishing operation.

On jobs where production requirements are high, like the finishing of bores of this 8-cylinder block, shown above, BARNESDRIL Multiple Spindle Honers are paying for themselves in time savings. Two machines are used, the first for rough honing, and the second for mirror finish honing. The bores of the block are honed simultaneously by the 8 spindles of the Multiple Honer. Production is approximately 100 blocks per hour, whether 8, 6 or 4-cylinder blocks.

Where high production is required on individual parts, such as tractor sleeves, more than one part can be honed simultaneously on a Multiple Honer like the BARNESDRIL No. 214 Machine shown right above. Special fixtures designed to hold more than one part enable the operator to hone several parts in one operation.

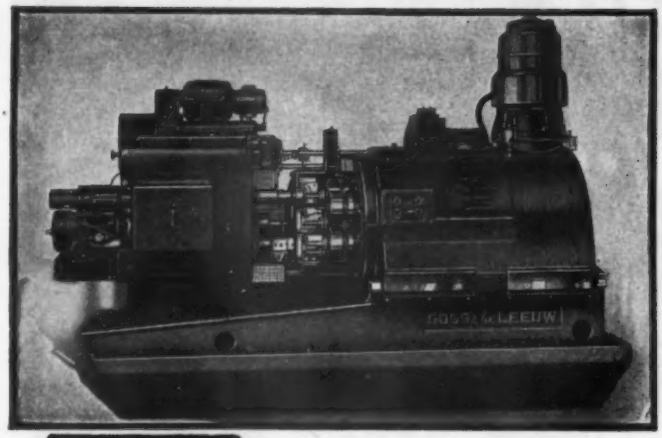
Less specialized honing applications where production does not warrant the use of a Multiple Spindle Honer can be handled satisfactorily with the BARNESDRIL Single Spindle models.

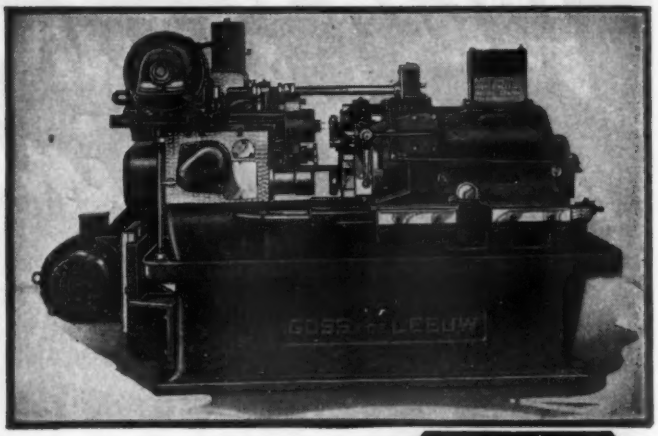
Submit your internal finishing problems to BARNESDRIL Engineers. The men who pioneered the field of honing machinery will study your part and recommend the machine best suited to your part design and production requirements. There is no obligation.

GET THIS FREE DATA— Bulletin No. A-121 describes the honing process and gives complete descriptions and specifications of the BARNESDRIL Honing Machines. Write for your copy today.

Barnes Drill Co. 830 CHESTNUT STREET ROCKFORD ILLINOIS, U.S.A.

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES





WORK ROTATING TYPE
5 Spindles
6 Spindles
8 Spindles

Features include:

Lead Screw Threading on both types—Preloaded Anti Friction Spindle Bearings—Hardened Ways—Oversize Spindles—Gears of Chrome-nickel steel, carefully heat-treated.

Write for copy of descriptive catalog giving complete, detailed specifications.

TOOL ROTATING TYPE
4 Spindles
5 Chucking Positions

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

If it's a small part, turn it with Precision, Speed and Profit on a

SHELDON LATHE

Model S-56
10" Precision Lathe

All SHELDON lead screws are cut on the finest Pratt and Whitney "Super-precision" lead screw machine

BUILDERS of GOOD LATHES since 1919

Engineered for precision shop and tool room work. Rigidly built to stand up and hold its close accuracy under round-the-clock operation. This is a quality machine tool in every detail, yet is moderate in price . . . a lathe that stands out far ahead of others. (The lathe selected by U.S. Army, the Navy and the Marine Corps, for mechanized machine shops, instrument repair shops, etc.)

Contact us or your local Sheldon dealer for prices, engineering data, deliveries, etc.

- **Bronze or anti-friction bearings**
- **1" Collet capacity**
- **11¼-inch swing**
- **Double-walled apron**
- **Large hardened and ground spindle**
- **Extreme accuracy**
- **Convenient controls**
- **Underneath V-belt motor drive**
- **All Steel Bench**

SHELDON MACHINE CO., INC., 4234 N. KNOX AVE., CHICAGO 41, U. S. A.

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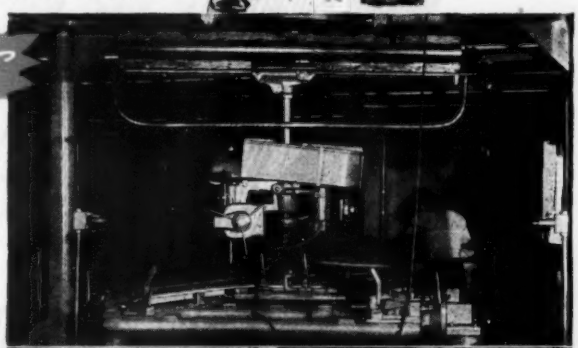
Walker-Turner Machine Tools have effected remarkable savings in war plants. Their wide range of operating speeds permits selection of optimum (most economical) cutting speed for every material. Simple, easy operation makes every man-hour more productive. Streamlined flexibility permits economical tooling set-ups. Low price and low power consumption keep capital investment and operating costs at a minimum.

Use Walker-Turner Machine Tools for the many jobs within their range and reserve heavy equipment for heavier work.

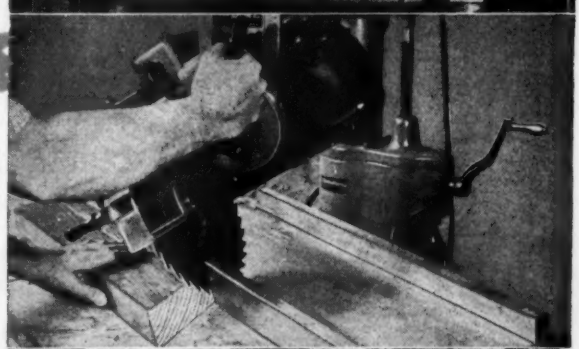
Walker-Turner Co., Inc., Plainfield, N. J.

METALS



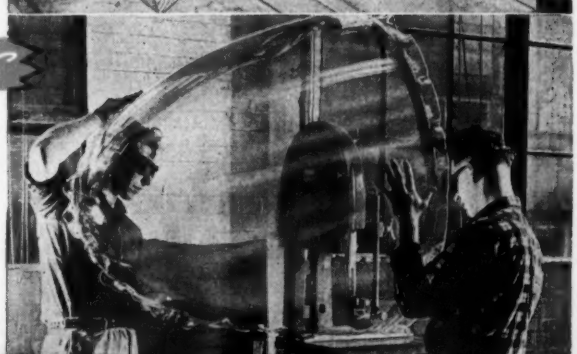
Fast positioning and wide range of speeds make W-T Radial Drills ideal for this job at the plant of a large aircraft builder.

WOOD



W-T Radial Saw cross-cuts, rips, dadoes, miters, routs, tenons, Also available in metal-cutting model.

PLASTICS



Speed range from 61 to 5300 s.f.m. in this W-T Band Saw cutting Plexiglas bomber nose at Rohm & Haas

CERAMICS

W-T 15" Drill Press has high speeds and spindle stability for fine drilling at General Ceramics plant.

walker-Turner COMPANY, INC. PLAINFIELD, N.J. U.S.A.

MACHINE TOOLS

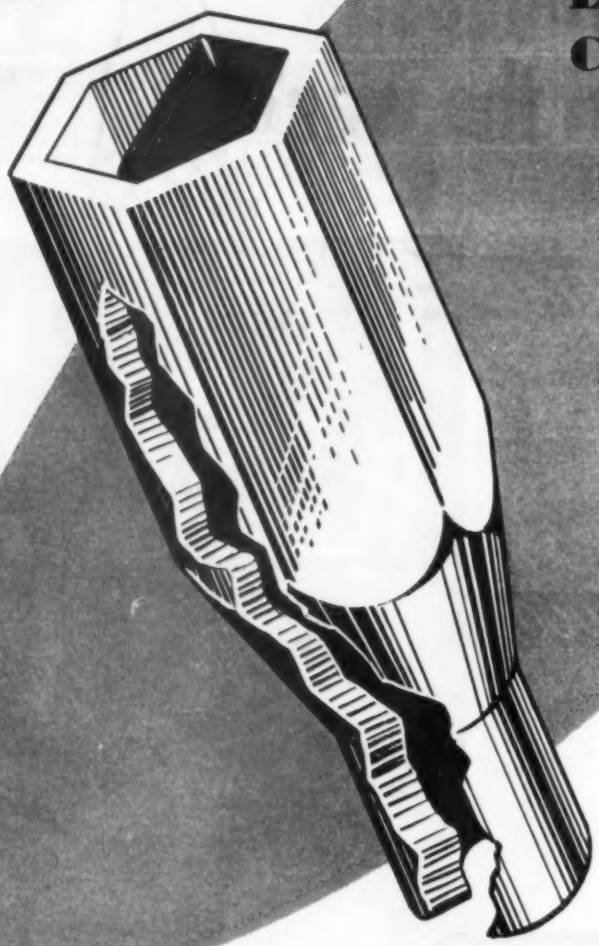
DRILL PRESSES — HAND AND POWER FEED • RADIAL DRILLS
METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
RADIAL CUT-OFF MACHINES FOR METAL • MOTORS • BELT & DISC SURFACERS

Can you produce this part...

WITHOUT MACHINING?

Second of a series illustrating the use of Swaging in war production.

ETNA SWAGING UNITS Can... and do!



Almost any part we can name, that involves complicated tapering, sizing or reducing operations can be produced quickly, easily and with extreme accuracy on ETNA Swaging Machines—*without* resorting to machining. Swaging will greatly reduce production time and costs in your plant . . . first by eliminating certain preliminary machining operations, and, second, by savings in material—for with Swaging no metal is cut away. Rather it is compressed, thus strengthening the metal structure!

A note to ETNA today describing your tapering, sizing and reducing problems will bring complete, descriptive material on the advantages of Swaging as applied to your particular operations.

ETNA Swaging Machines are built in standard sizes with maximum capacities from 3/8" to 6"—die lengths up to 18" for tapering sizing and reducing of hollow, solid, round or angular parts. Larger sizes up to 14" Dia. are built to order.

IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

The ETNA Machine Co.

3400 MAPLEWOOD AVENUE

TOLEDO 10, OHIO

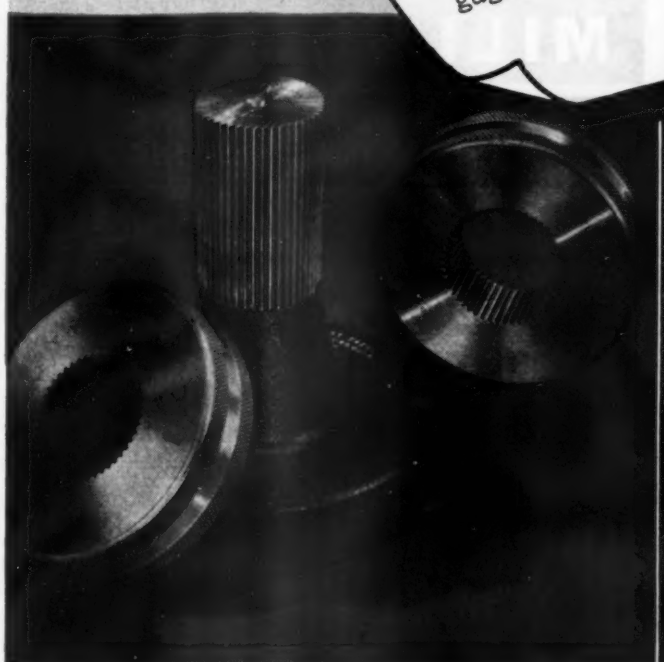
MEMO...from the desk of Exec. Vice President.

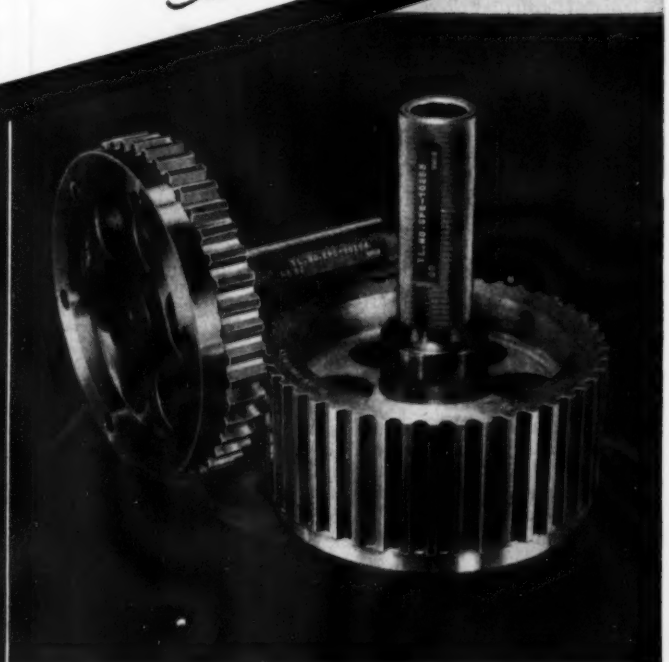
Att. Advertising Dept.

INVOLUTE
SPLINE GAGES
BY VINCO

"Setting by Tiffany" — "Gage Blocks by Johansson" — names that because of consistent perfection inspire confidence in the product — the ultimate goal of every conscientious manufacturer — Vinco has qualified for this select group — for instance, "Involute Spline Gages by Vinco" — even competitive consensus agrees that we lead the field in this branch of gaging — we pioneered involute spline gages — we developed grinding, lapping and control methods — exclusively Vinco — that produce involute spline plugs and rings so consistently perfect that "Involute Spline Gages by Vinco" is an accepted standard wherever gages are used.

E. E. Butler





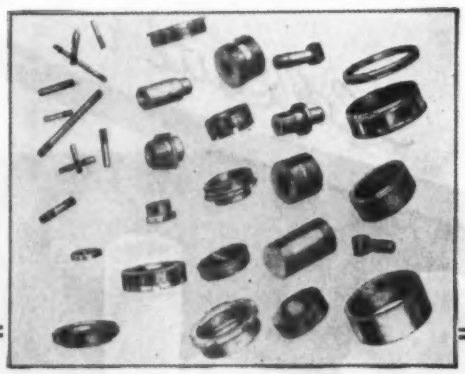
MILLIONTHS OF AN INCH FOR SALE BY VINCO

REG. U. S. PAT. OFF.

VINCO CORPORATION, 8851 SCHAEFER HIGHWAY, DETROIT 27, MICHIGAN; SALES OFFICES, NEW YORK, CHICAGO, CLEVELAND

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development

Any parts that can be chucked can be threaded on the COULTER HOB THREAD MILLER



. . . a universal machine for automatic production of internal or external right or left hand threads

Hob Threaded work can be handled with speed and precision on this rigid, simple fully motorized machine. The variety of work it is capable of handling is almost unlimited because any parts that may be held by chuck or special fixture can be threaded. The design of this machine is such that long work can also be accommodated.

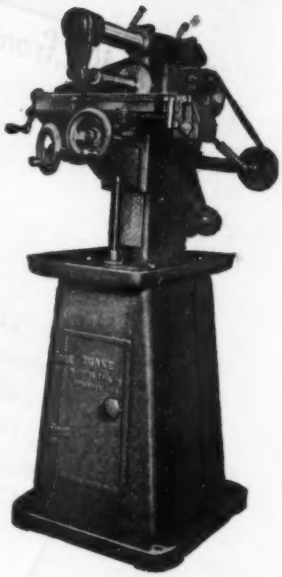
Work and cutter spindles are each driven by individual motor, a wide range of speeds and feeds being available for threading of parts of various materials. Once the machine has been started on the first piece, the entire operation is automatic until time for unloading.

Explore the possibilities of the "Coulter" on your external and internal threading by writing for further information.

THE JAMES COULTER MACHINE CO.
BRIDGEPORT, CONNECTICUT

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!



Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

MILLHOLLAND

Automatic **DRILLING - BORING MILLING - TAPPING** *Units*

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.

Vertical ROTO-MATICS

Multiple spindle drill heads and automatic clamping provide added production.

Continuous operation is essential for maximum production. VERTICAL ROTO-MATICS are continuous operating, multiple spindle, non-indexing machines that are adaptable to a wide range of machine problems. . . . ***Bulletins 110 and 120*** may help you solve your problems. Write for them.

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
6411 W. Burnham St. Milwaukee 14, Wisconsin

Bring on your Blueprints

..FOR TODAY AND TOMORROW!

● Speed up your milling operations today—with machines that will be *right* for your needs tomorrow! Call on Kent-Owens for the practical features you'll want in investing for *permanent* business.

Shop men everywhere appreciate the outstanding *dependability, economy* and *flexibility* of these machines . . . adaptable to a wide range of work. Rugged . . . simple . . . efficient. Write for latest bulletins. Kent-Owens Machine Co., Toledo, Ohio.

THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
Hamilton-Huster Machinery Co.

DAYTON
Gosiger Machinery Co.

DETROIT
A. C. Haberkorn Machinery Co.

GRAND RAPIDS
Joseph Monahan

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
Oatis-Booth Machinery Co.

KANSAS CITY
Eichman Machinery Co.

LOS ANGELES
Eccles & Davies Machinery Company
Harron, Rickard & McCone

MILWAUKEE
Neff, Kohlbusch & Bissell

MINNEAPOLIS
The Satterlee Company

MOLINE
John J. Normoyle Co.

MONTREAL
F. F. Barber Machinery Co.

NEW ORLEANS
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SYRACUSE
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TORONTO
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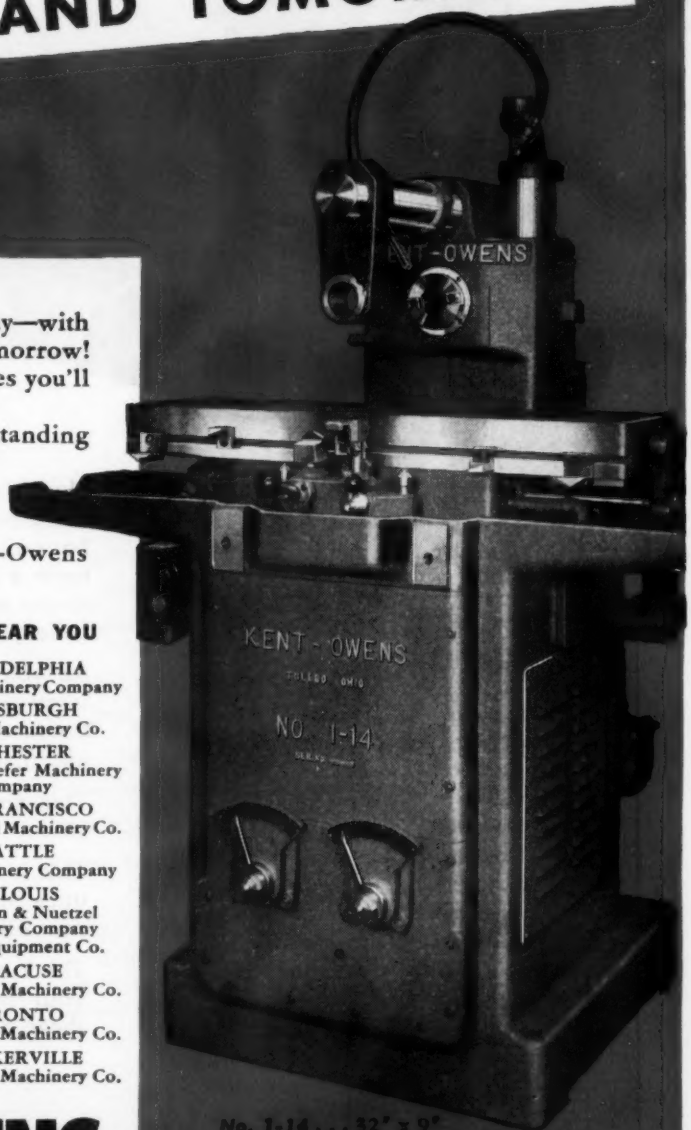
F. F. Barber Machinery Co.



No. 1-14 . . . 32" x 9" table . . . 14" table travel . . . hydraulic table feed . . . full automatic cycle.

Call on KENT-OWENS *for Milling Machines*

Still Another Application of the No. 10 LeMaire Drilling Machine

ROUGH and FINISH BORING
—FACING (Fly-Cutting)—
COUNTERSINKING

All performed in continuous operation on one machine

Mounted on a standard No. 10 LeMaire Vertical Drilling Machine is a No. 5000 Twin Ram equipped with a LeMaire boring, facing (fly-cutting) and chamfering head. Here you have a complete machine that performs several operations at one setting with greater speed and accuracy than has ever been possible before.

As you know, conventional face milling cutters used on large diameters very frequently produce disappointing results because the vibrations that are set up cause chatter marks and inaccuracies in work.

This machine produces ten housings an hour at 100% efficiency with carbide tipped tools.

This is only one of the many ways in which these hydraulic units are combined with our standard drilling units to bring new efficiencies in production.

Think of the process as well as the product when you plan your postwar production. Let us explain the versatility of these machines.

How THE MACHINE OPERATES

A push on the starter button causes the head assembly to rotate as it approaches the work. After the unit drops into feed and completes the rough and finish boring of the 11.125 hole, "stop rings" on the guide bars stop the downward movement of the assembly but it continues to rotate and move the quill with the facing tools to "fly cut" across the work. A bell-crank then actuates the countersinking tool which feeds to depth and dwells before returning to unloading position.

LeMaire

BUILDERS OF
SINGLE AND MULTIPLE SPINDLE MACHINES
FOR BORING, DRILLING, REAMING,
TAPPING, ETC.—TWIN RAM HYDRAULIC
UNITS—MATCH-IT GEAR CHUCKS

LE MAIRE TOOL & MANUFACTURING CO., 2657 SO. TELEGRAPH RD., DEARBORN, MICH.

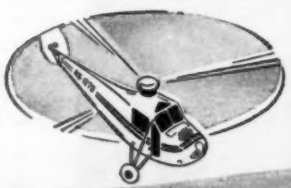
37 Precision Operations? —Yes, Sir! — it's a Job for Aeronautical Products, Inc.

THERE'S A BIG advantage in having intricate parts produced by a single organization under single, controlled responsibility. No buck-passing, no costly delays. Long before Pearl Harbor we built a reputation on volume production of industrial and aircraft engine parts, large or small, hardened and ground, micro-finished.

From automatic screw machines, through grinding, thread grinding and milling, hypro-lapping, heat treating, nitriding, plating and magnafluxing, we give you the COMPLETE job!—and we work to tolerances as low as .0001, at top-speed production.

While we're now geared to total war output, we may have an open capacity on your parts problem . . . so why not write our Executive Sales Office for an impressive booklet on our complete plant facilities.

★ BUY MORE BONDS ★



● *THE SUCCESS of The Aeronautical Products, Inc. Helicopter, designed and built by our own craftsmen promises new accomplishments in the post-war age of flight.*

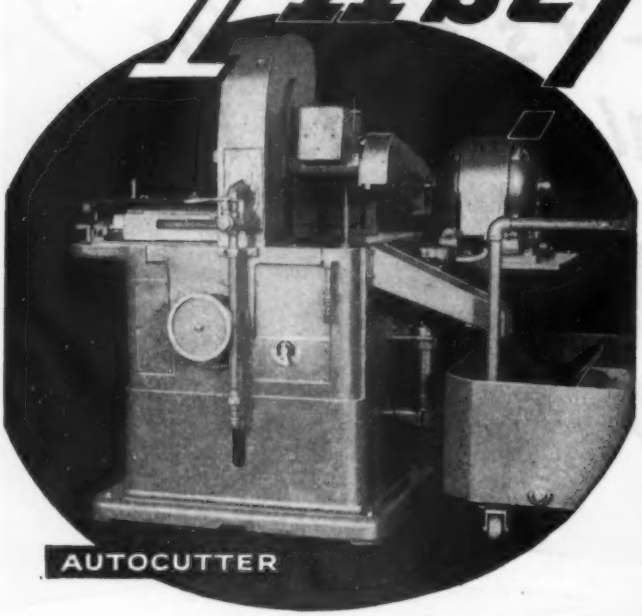
AERONAUTICAL PRODUCTS, Inc.

DETROIT PLANT and Administrative Offices: 18100 Ryan Road, Detroit 12

API

OHIO PLANT: Washington Court House Ohio

IT'S A *First*



Yes, this **CAMPBELL "MODEL 700"** is the first *fully automatic* abrasive cutting machine ever built. Coming from **CAMPBELL**, manufacturers of the most complete range of abrasive cutters, that's big news.

This "700" is "first" another way. It is the opening announcement of **CAMPBELL'S** post-war program of development, based on wartime improvements all through the line. Other announcements will follow.

Maybe there's a way a **CAMPBELL ABRASIVE CUTTER** could speed up or economize your production. It's easy to find out.

WHY NOT DO THIS?

Write and tell us (1) the range of sizes, (2) kind of material, (3) length of cutoff pieces, (4) length of stock before cutting, (5) tolerance for length of cut pieces and (6) hourly production requirement. With this information, **CAMPBELL** engineers can recommend production procedure and work up cost sheets for you.

Campbell

ABRASIVE CUTTING MACHINES

ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

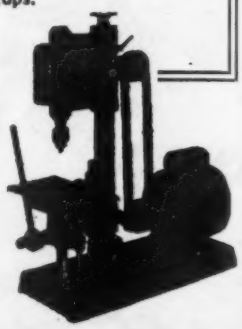
For Sensitive Tapping of Precision Work

HAMILTON-MUEHLMATT SENSITIVE TAPPING MACHINE

- Here's a high speed, sturdy little tapping machine which is especially adapted to precision tapping of light work. It is now being used very successfully for tapping parts for instruments, cameras, watches, clocks and business machines.

It has gained wide acceptance due to the high quality of work produced because of its particularly smooth operation without breakage of even the finest taps.

Mechanically simple and easy to operate, a man can become expert in an hour or so of operation. Quiet—no noisy reversing mechanism nor slinging of oil. Can be plugged in any light socket. For full information write for bulletin.



PERTINENT DATA

Capacity—From smallest and finest tap to 10-32 inclusive.
Power 1/6 H.P., 1750 R.P.M. Motor, A.C.
Tapping speeds approx. 1200 to 2800 R.P.M.
Size of machine—10 in. x 7 in. x 22 in. high
Weight—Approx. 60 pounds

The Hamilton Tool Co.

830 NINTH ST. HAMILTON, OHIO

For STEPPED-UP WAR WORK

It's all out production now until Victory, so any equipment that can save time and manpower is important. We present the Linley high speed Milling and Jig Boring machine as a definite asset to any toolroom, for its ability to keep the small jobs cleaned up . . . die making, jigs, models, metal patterns and the usual reaming and milling work so necessary.

Important Features

- Eight spindle speeds, 275 to 4250 R.P.M.
- Direct micrometer setting
- Backlash of quill travel eliminated
- Grease-sealed bearings, velvet feed
- Ample table size 7"x17½"
- Table top to spindle, 11½"
- Small floor space, 18½"x20"

A precision tool, fast set-up, easy change-over, a money maker in any shop.

SEND FOR BULLETIN

LINLEY

BROTHERS COMPANY
564 STATE ST. EXTENSION
BRIDGEPORT 1, CONN.

BAKER Model 60-HO-4

does this for Mack Trucks

Heavy duty operations handled on this BAKER unit involve rough machining, finish boring and chamfering the banjo surface on the cast steel axle housing used in the Mack Prime Mover truck. To do this job requires power, rigidity, accuracy and *speed*. The BAKER 60-HO-4 more than meet requirements.

Interesting phases in the production operations on this machine include:

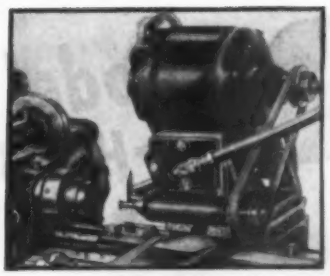
1. The heavy cut required is made *without* auxiliary tool supports.
2. Operator fatigue is minimized because of the convenient push-button cycle station.
3. Cycle includes a coarse feed for boring and changes automatically to a finer feed for facing.
4. A special fixture mounted on the large table surface, which is in turn mounted directly to the machine base, insures absolute rigidity.
5. Machine design permits spindle speed changes as well as feed changes.

The BAKER 60-HO-4 can also be furnished in horizontal types for various operations.

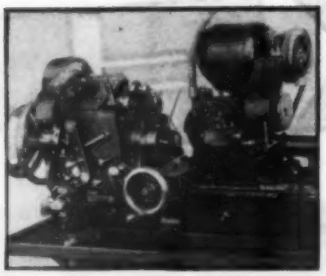
Write for further particulars on this and other BAKER machines. Our Engineering Department will be glad to consult with you on special problems

BAKER BROS., INC. • TOLEDO 10, OHIO

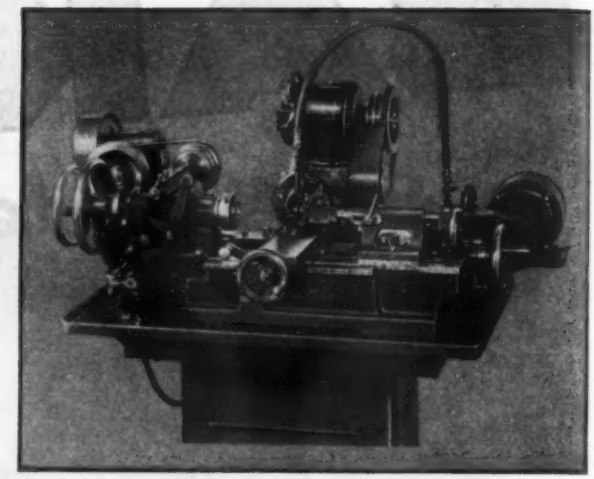
SINGLE AND MULTIPLE SPINDLE MACHINES FOR DRILLING, BORING AND TAPPING



Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.

Special Equipment Extends Utility

Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

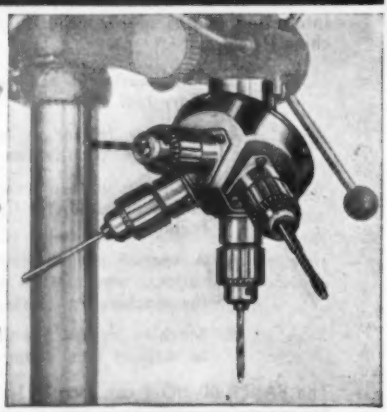
WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM
TRADE MARK REGISTERED U S PAT OFF

THE NEW **QUADRILL**

TURRET ATTACHMENT FOR DRILL PRESSES



RIGID ALIGNMENT STRICTLY ACCURATE

EASILY ATTACHES TO QUILL OF PRESS

QUICK INDEXING

FINGER-TIP CONTROL CHANGES DRILL POSITIONS

4 DRILL PRESSES IN 1

Multiply drill press production 4 times with the new QUADRILL. Attaches directly to the quill of most drill presses. Three drills remain stationary for safety while only drill in work position operates. Actually converts a single drill press into four. Does away with moving work from press to press and reduces frequent changes of tools. Saves floor space. All this and more. Write for complete details and prices today.

CHICAGO DRILLET CORPORATION

919 N. MICHIGAN AVENUE, CHICAGO 11, ILLINOIS

PRESSES
FEEDS
AUTOMATIC EQUIPMENT

The V & O Press Company, Incorporated

HUDSON, NEW YORK

DAVIS KEYSEATER

This low cost machine will handle internal keyseating jobs up to 1¼ in.

Write for illustrated bulletin.

DAVIS KEYSEATER CO., 403 Exchange St., Rochester, N. Y.

BUILT BY E. R. SEIFERT, INC.

AUTOMATIC...COMBINING SEVERAL OPERATIONS

This machine takes flat copper wire from reel . . . and through a series of automatic operations, including insertion of insulating paper between turns, ejects completely finished automobile starting motor field coils.

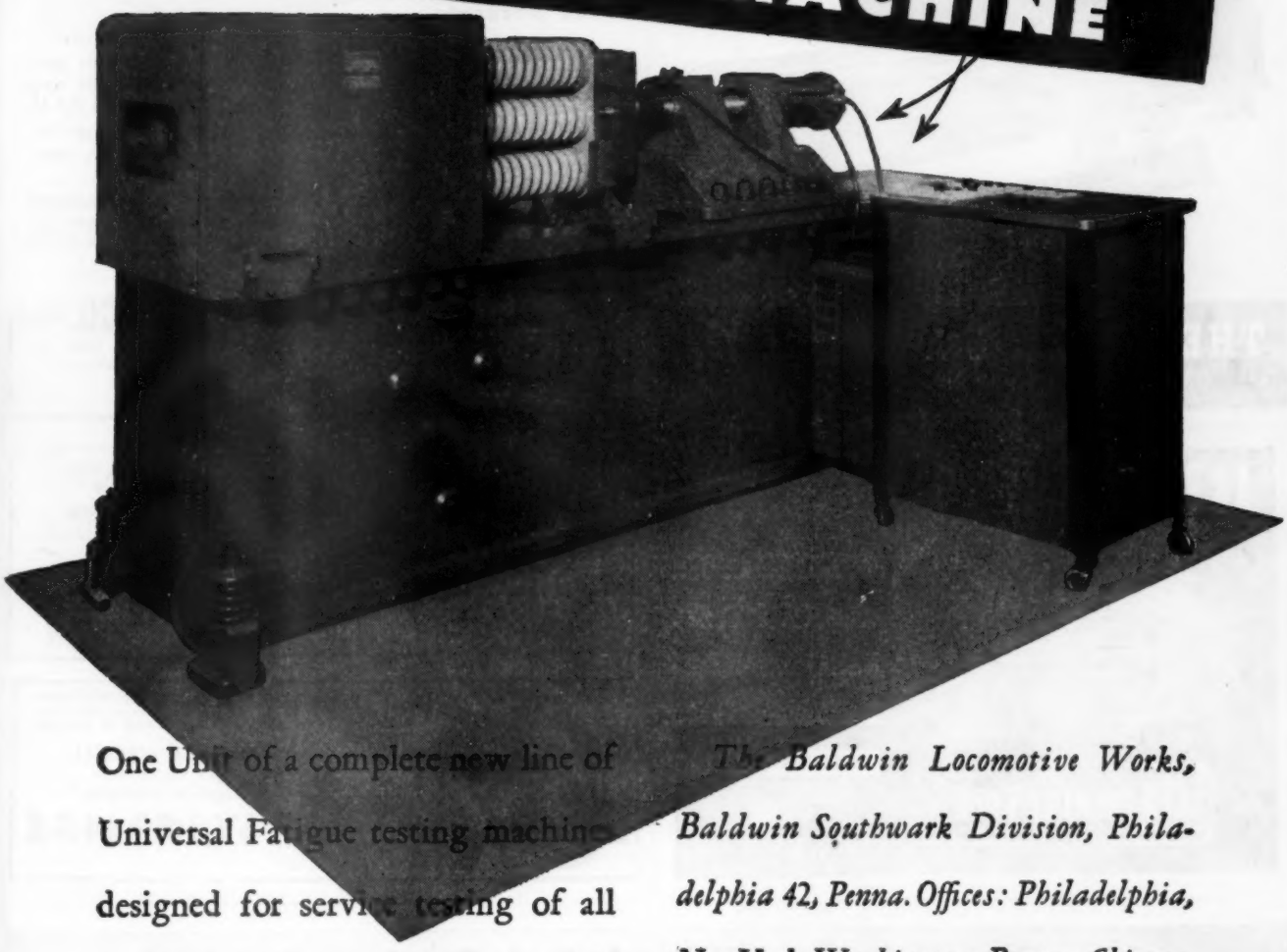
We review your special automatic wire forming or coil winding problems and offer standard machines in stock . . . or design special machines to your specifications.

E. R. SEIFERT, INC. 202-204 S. BEECH ST.

Syracuse 10, N. Y.

10,000 lb

UNIVERSAL FATIGUE TESTING MACHINE



One Unit of a complete new line of Universal Fatigue testing machines designed for service testing of all materials and assemblies. These models test in torsion, direct stress, and flexure and incorporate many novel loading and controlling methods.

The Baldwin Locomotive Works, Baldwin Southwark Division, Philadelphia 42, Penna. Offices: Philadelphia, New York, Washington, Boston, Chicago, St. Louis, Cleveland, San Francisco, Houston, Pittsburgh.

BALDWIN

TESTING EQUIPMENT

PORTAGE

HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

THE PORTAGE MACHINE CO.
AKRON 11, OHIO

REED TYPE 25 BENCH DRILL

SPECIFICATIONS

Capacity—¼"
Jacobs Chuck—7-1A
Spindle Travel—3"
Head Adjustment—3"
Spindle to column—7"
Spindles—Center to Center—8"
Bench space (single spindle) 15"x32¼"

Rugged, Simple, Versatile and Accurate

This modern, streamlined machine with direct, single belt drive from motor to spindle, will handle a wide variety of light work because of its infinite speed range from 1500 to 10,000 R.P.M.

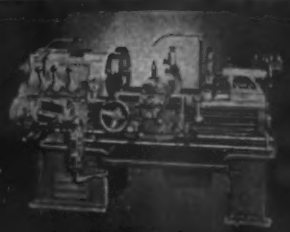
It is totally enclosed, with no moving part exposed except the drill chuck—a safety feature of outstanding importance, especially where women operators are concerned.

This machine—made in from 1 to 4 spindle models—is equipped with full ball-bearing spindle and powerful motor. Speeds are controlled by hand wheel, a speed indicator showing speeds at a glance.

Write for literature giving complete information.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
GREENFIELD, MASS., U. S. A.

REED-PRENTICE



LATHES • JIG BORERS
DIE SINKERS
DIE CASTERS
VERTICAL MILLERS
INJECTION MOLDERS

REED-PRENTICE CORP.
WORCESTER 6, MASS. U.S.A.

LUCAS "PRECISION"

Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

Giant KEYSEATERS

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

CARLTON RADIAL DRILL

"Anti-friction Bearings Throughout"

FEATURES— 1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

The **CARLTON**
MACHINE TOOL COMPANY
CINCINNATI, OHIO, U. S. A.

ARMY E NAVY

THE *Avey* CAM FEED UNIT

No. 1 Size—
1/2" capacity in cast iron.
No. 2 Size—
7/8" capacity in cast iron.

Designed for universal applications. Illustrated are *Avey* machines equipped with Cam Feed Units to answer the demand for high production equipment.

This simple unit gives high production at a lower cost. When used in multiples to complete operations, no re-location of parts is necessary, thus producing more accurate work.

Semi-skilled operators will deliver high production accurately, efficiently, with a minimum of supervision.

THE AVEY DRILLING MACHINE CO. • CINCINNATI • OHIO

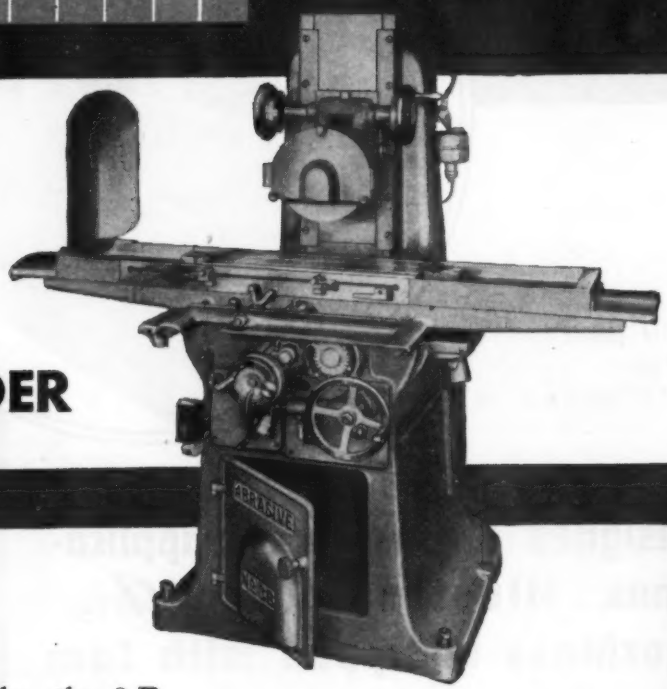
Avey DRILLING MACHINES

ABRASIVE

ACCURACY BOOSTS PRODUCTION

3-B

SURFACE GRINDER



Precision built for *precision* jobs, the 3-B Surface Grinder produces work of highest quality and meets the pace of heavy schedules. Its massive 1600 lb. bed casting (total weight of machine approx. 2500 lbs.) and rugged table, alloy steel spindle (1⅝" o.d.)—hardened, ground and lapped, wheel slide graduated to one ten-thousandth inch, superior workmanship and materials—all contribute to the exceptional accuracy and long life of this versatile, efficient machine.

TWO TABLE SPEEDS
20 and 40 feet per minute
AUTOMATIC FEEDS
ATTACHMENTS & ACCESSORIES
Wet Grinding Attachment
Dust Exhauster
Radius and Angular Truing Device
Index Centers
Swivel Vise
ALLOY STEEL SPINDLE
Hardened, Ground and Lapped
ONE-PIECE BED CASTING
CAPACITY
Longitudinal 24" Transverse 8"
Vertical 12"

Send for Descriptive Bulletin

ABRASIVE MACHINE TOOL CO., East Providence 14, R. I.
Dealers in Principal Cities

THE BEAUT

Threadwell

COLD-TEMPER

TAP PERFORMANCE IS MORE THAN

Skin Deep

Tap users who haven't tried COLD-TEMPER Taps are apt to have the notion that *cold-tempering* provides only a surface or "skin" hardening effect that disappears as soon as the tap gets its first sharpening.

Actual performance proves that Threadwell *cold-tempering* at 120° below zero improves the metal structure of the tap through and through yet makes it actually less brittle than high speed taps having only the usual heat treatment. Threadwell *Cold-Temper* Taps cut better threads and keep on cutting them longer, both before and after each sharpening. Tap life is definitely increased.

Don't take our word for it The "proof of the pudding is in the eating". Try Threadwell *Cold-Temper* Taps on steels, cast iron, alloys, plastics, whatever production tapping you may have that will put them to the sternest test.

Threadwell *Cold-Temper* Taps cost no more All you need to do is ask your local Threadwell Distributor to make your next lot of high speed taps, *COLD-TEMPER* Taps.

DISTRIBUTORS IN LEADING INDUSTRIAL CENTERS THROUGHOUT AMERICA
EXPORT STOCKING DISTRIBUTORS
CANADA, Bridge Machinery Co., Montreal;
ENGLAND, Skylux Ltd., London and John H. Graham and Co., Inc.
THROUGHOUT THE WORLD

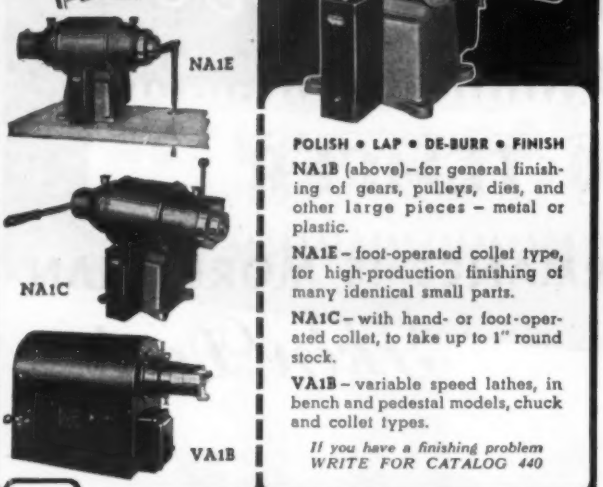
Threadwell
SINCE 1902
"TAPS OF DISTINCTION"

THREADWELL TAP AND DIE COMPANY • GREENFIELD, MASSACHUSETTS, U. S. A.

IDEAL SPEED LATHES

For accurate, uniform, speedy finishing of metal & plastic parts.

AWARDED October '42



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NA1B (above)—for general finishing of gears, pulleys, dies, and other large pieces – metal or plastic.

NA1E – foot-operated collet type, for high-production finishing of many identical small parts.

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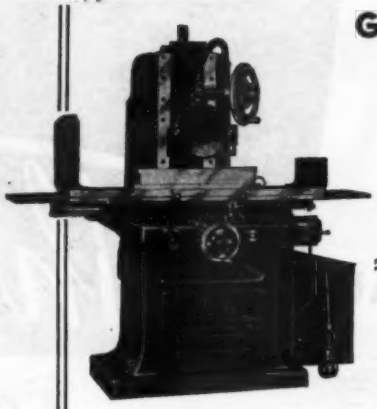
No. 35 Hydraulic Feed

SURFACE GRINDER



. . . for speed, convenience, precision and economy

The No. 35 with 8"x12"x24" capacity—is one of many sizes of Grand Rapids machines of this type. Wide flexibility is provided by hydraulically operated longitudinal table travel and cross feed. Table speed is variable and can be obtained up to the maximum instantly and conveniently. Adjustable, automatically operated cross feed is provided.

Send for Bulletin GL 100 containing full details.

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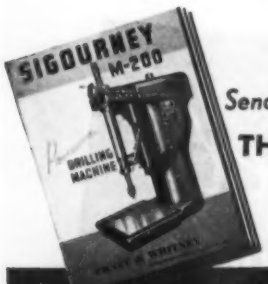
NEW PRECISION DRILLING MACHINE

A new bench machine for the finest precision drilling . . . No. 1 Morse Taper . . . drills up to ½" diam. . . . all spindle speeds from 700 to 4000 rpm. through variable speed drive. Available in 1, 2, 3 and 4 spindle models.



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sizes 12" to 32" stroke

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FOR FURTHER DETAILS SEE FULL PAGE AD IN PREVIOUS ISSUE

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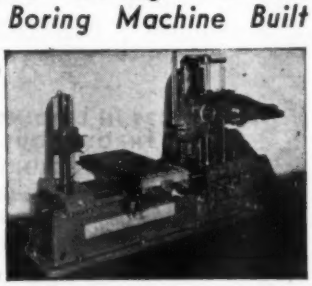
UNIVERSAL *Horizontal Boring Machine*

The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.



Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

HI-Q says:

"QUALITY contributes to Victory by GETTING OUT THE TOUGH BIG JOBS ...and F-A-S-T"

● It's a fact that almost any shop can do a pretty good job on the small work. But it's a different story when you get to the BIG STUFF.

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More resistant to heat . . . Less sensitive to humidity

Now you'll get substantially increased cutting life from your high speed belts, discs and coated abrasive specialties—by using Behr-Manning Metalite Cloth Durabonded.

Durabonded Coated Abrasives are the result of a remarkable new Behr-Manning process for hardening and strengthening the adhesive bond. Because of greater hardness and strength Durabonded products resist cutting heat, the cause of loading and glazing. Durabonded products are also less sensitive to humidity, thus they assure higher production and greatly increased cutting life.

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Sterling Viking Diesel 8 cylinder engine—supercharged.

For nearly half a century the Sterling Engine Company has won world-wide fame for manufacturing marine and industrial engines.

Under the pressure of war it was necessary to combine this uncompromising practice of quality manufacture with mass production procedure. This meant a complete change-over from custom methods to a modern production line from which came engines of Sterling's traditional quality—at the speed required by the armed forces.

A. W. Hecker contributed to this outstanding project not only by assisting Sterling engineers in determining machinery and tool needs and operation schedules—but also by designing and building the jigs and fixtures.

Today from these Sterling production lines is coming new power for a new world—gasoline, gas and diesel engines that give greater power per pound of weight with less operation and maintenance costs—engines which are the combined result of the skilled technique of Sterling engineers and Hecker's ability to tool up such a project.

Perhaps some outside engineering and tooling assistance will do as much for you. A **Hecker** engineer is available for such a discussion—without obligation, of course. Write for our new brochure:

MEN AND MACHINES
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ENGINEERING
TOOL BUILDING
PRODUCTION

TOOLING—FOR SPEED AND ACCURACY

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ENGINEERS *and Tool Makers*

Established 1931

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at threats to stud setting speed and efficiency!

HERE'S an Apex stud setter with the smallest O.D. we know of. It works close to shoulders, projections, etc., drives easily and accurately in tight spots normally hard-to-reach. Proves to be a simple, effective tool for either hand or power operation. *Important:* It's an ideal tool for "green" hands. It's easy to adjust, and once set for desired length of thread on stud, *stays adjusted.*

Four sizes supplied for studs up to 1¼" in diameter. Your choice of Morse taper shanks, hex drive, T-handle combination with female square for torque wrench.

Stud setters are only one branch of the Apex family of fine production tools. Write for any of these catalogs listed below.

Chuck and tool holders: Catalog No. 14; Power bits and hand drivers for Phillips screws: Catalog No. 15; Power bits for slotted head screws: Catalog No. 16; Power bits and hand drivers for clutch head screws: Catalog No. 17; Stud setters: Catalog No. 101. Insert type power bits and hand drivers for Phillips recessed head screws: Bulletin No. 102.

APEX

THE APEX MACHINE & TOOL CO., DAYTON, OHIO

Manufacturers of Safety Friction Tapping Chucks, Quick Change and Positive Drive Drill Chucks, Vertical Float Tapping Chucks, Parallel Floating Tool Holders, Power Bits for Phillips, Slotted Head and Clutch Head Screws, Hand Drivers for Phillips and Clutch Head Screws, Aircraft Universal Joints, Plain and Universal Joint Socket Wrenches.

GRIND CARBIDE-TIPPED TOOLS AND DIES BETTER!

You can now get a better edge on carbide-tipped tools and dies—and no burns or discoloration. Grind them with the Por-os-way wheel with *green* silicon carbide. Back from the war, this remarkable ingredient does the *trick* in this *toughest* of Por-os-way wheels.

2 TO 5 TIMES LOWER GRINDING COSTS

MORE JOBS after the war ...IF production is kept high ... IF wages are fair ... IF labor is cooperative ... IF laws are helpful ... IF taxes are sensible.

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IF there's such a thing as machinists' paradise, your men will be in it when they work with Por-os-way Grinding Wheels. Take it from users who've lived with this wheel for four tough years. They found it cuts hardest metals deeper, faster and cleaner. They learned that *open structure* Por-os-way works cooler, lasts longer and saves time on both rough grinding and precision finishing. They cut down rejects, boosted war production.

And in the peacetime of the future, Por-os-way will cut grinding costs way below competition. But don't take *our* word for it—make us *prove* what Por-os-way can do. Call in a Por-os-way engineer. A. P. de Sanno & Son, Inc., 430 Wheatland St., Phoenixville, Pa., Since 1893.

LOOK AT THE DIFFERENCE!

Your eye tells you at a glance why Por-os-way is *different.* See the *extra porosity* that gives you over 8 distinct operating advantages!

RADIAC*

POR-OS-WAY*

The Precision Grinding Wheel

THE WHEEL THAT COSTS THE MOST AT FIRST... COSTS THE LEAST AT LAST

SKY'S THE LIMIT WITH POR-OS-WAY SEGMENTS

Find a surface grinding record and you'll find Por-os-way segments. They hog off more metal with fewer passes at higher speed. Por-os-way cuts deep, doesn't "scrape" the surface ... makes no moan, no groan, no grunt. Less time out for dressing, too. Give your surface grinding wings, yet hold costs down to ground level ... with Por-os-way!

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'TRU-LINE' *Diamond Tools*

'TRU-LINE multiple diamond tools require no turning. Machine down-time is reduced, production increased.

Diamonds are set in overlapping rows, providing a continuous and efficient cutting surface for the life of the tool—without changing, re-setting or adjusting.

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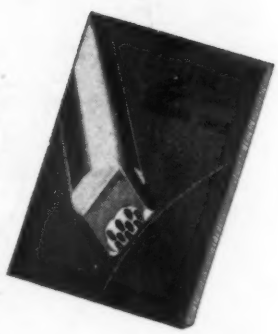
The effective use of smaller, carefully selected, high quality diamonds permits much lower diamond tool costs, yet assures efficient cutting.

TRU-LINE multiple diamond tools have consistently demonstrated their ability to deliver these four kinds of savings under all conditions of use on vital war material where speed, accuracy and finish are important factors. On many jobs they have completely replaced ordinary diamond tools.

There is a TRU-LINE tool for every type of straight, profile or step-dressing operation.

Send For This Book

It gives complete information on TRU-LINE tools, shows how they save time and money. Your copy gladly sent on request.



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A Nicholson 60° Cone Shape Rotary File in the chuck of a portable tool offers just about the handiest, "time-savingest" method there is for burring or countersinking holes in irregular or unwieldy castings. The file must, naturally, be of larger diameter than the hole.

This shape is also used for the second operation (removing bur) on screw machine when cutting inside threads.

Most important thing about Rotary Files is, of course, ***quality***. It is the first thing Nicholson thinks about, for quality is the priceless heritage of 81 years of Nicholson adherence to high file-making standards. You can be sure that Nicholson Rotary Files—whether Hand Cut or Ground—are ***right*** in every respect: Manufactured from high-speed steel; carefully shaped and true-centered; accurately cut and expertly hardened.

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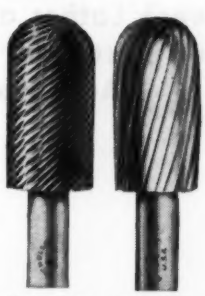
16 STANDARD SHAPES

(in either Hand Cut or Ground). 3 cuts—Coarse, Medium, Fine. 1/8" to 2" diameters.



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NICHOLSON ROTARY FILES

HAND CUT AND GROUND • FOR EVERY PURPOSE

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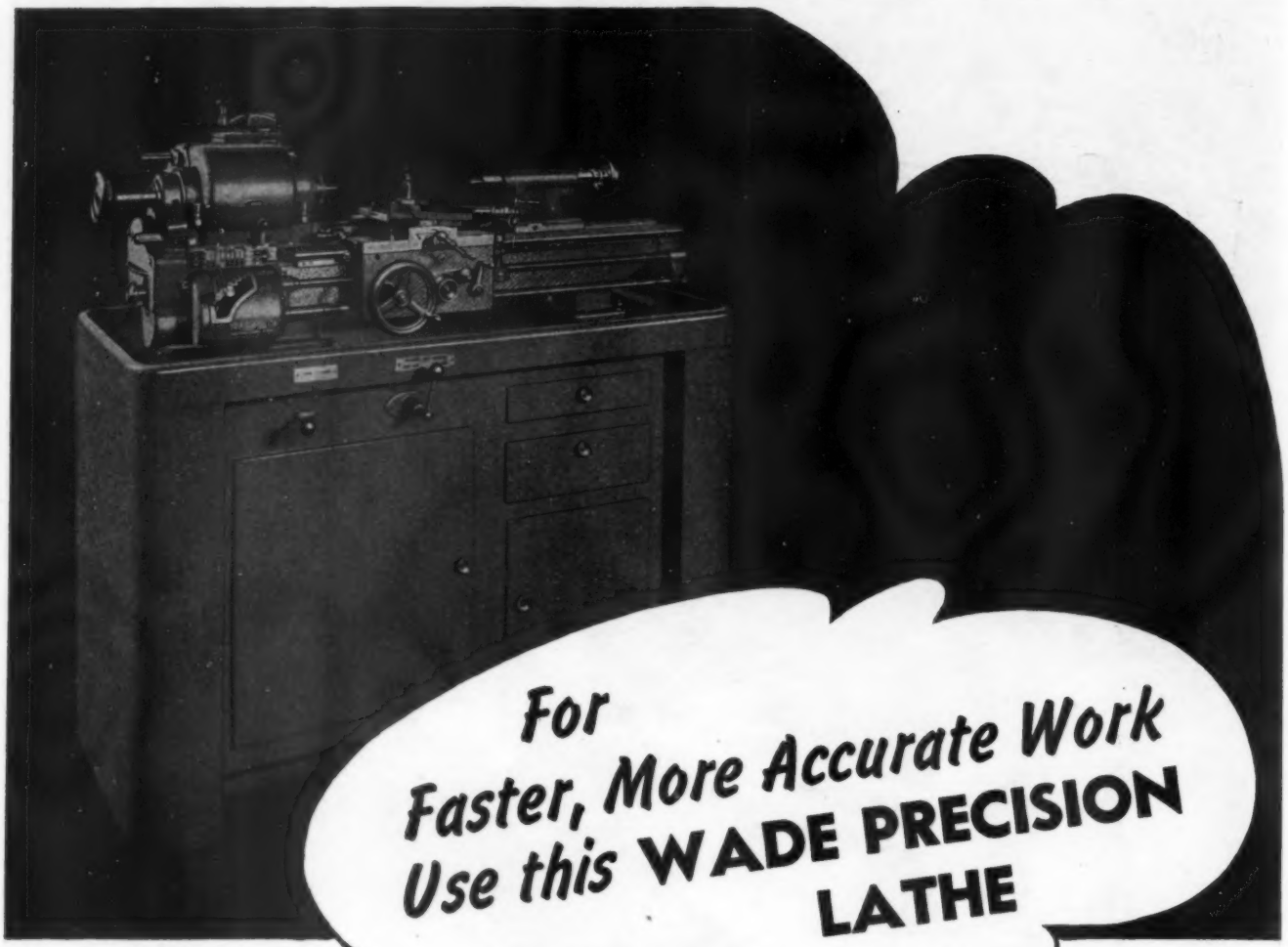

For Faster, More Accurate Work Use this WADE PRECISION LATHE

Wade

Bench Lathes and Profilers
For Precision, Versatility
And Stamina

You can get faster, more accurate work with the Wade Model 8-A Toolmakers' Precision Lathe because it is carefully designed and built with features that give it extreme accuracy for exacting work. It helps speed up production by enabling men to work faster, with greater accuracy and with less spoilage. Operators can get a larger daily output because all control and operating features are carefully worked out for efficient handling of work.

Lathe bed is 44" with 24" between centers; swing over bed is 8½" and maximum collet capacity is 1". Weight, 1075 lbs.

You can depend on Wade Precision Lathes to save time . . . to save money . . . and to produce accurate work. For more profitable production of precision work, investigate this machine today. Write for catalog now.

THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

Some day soon ★ TOM WILL BE AT YOUR SERVICE AGAIN

Before too long, the boys should be coming home. And that means Tom, too—the fellow who used to work for your *Industrial Supply Distributor. You remember him very well as the man who helped you that time you needed something special or something in a hurry and he came through for you by virtue of his digging up some source that was able to supply you.

Tom has learned much in the service that will benefit you. He has learned new technical skills, new ideas. His war-born experiences are sure to help you. So look for him when he returns . . . and you are sure to enjoy renewing that old acquaintance.

Remember the service your *Industrial Supply Distributor has given you, and . . .

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21 to 30	5⅜	.75
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If you buy 60 drills or more — 20% discount

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INC.
251 CENTER STREET
NEW YORK N. Y.

7 timely Questions on turning problems

AND THEIR ANSWERS

It's no longer necessary to single point turn or use other slow methods on short-run turning jobs. Many manufacturers are now getting the advantages of multiple tooling on short-run, as well as on mass production turning . . . *with automatic lathes.*

Following are a few important questions we have encountered while presenting the Sundstrand Automatic Lathe for short-run turning. Perhaps the answers will give you some helpful ideas on your present problems.

Q *What is the basic difference between an automatic lathe that can handle short-run work and one that can't?*

A On a Sundstrand it's the quick cycle change feature. Adjustments for various types and sizes of work can be made rapidly with a minimum of down time of the machine.

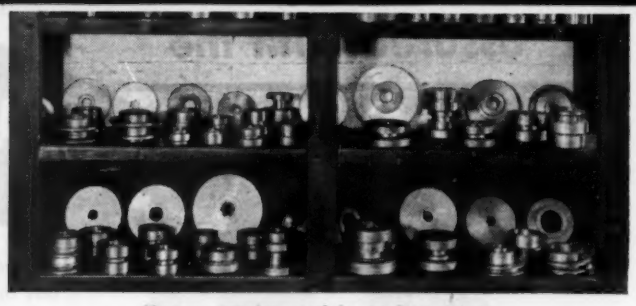
Cycle control disc for quick changeovers.

Q *Is there any difference between processing short-run and mass production work over an automatic lathe?*

A Very little. On a Sundstrand, the time saving features can be used to advantage by processing work of the same width first. Master samples for use in set-ups are also time savers.

Q *Is the type of short-run work that can be turned on an automatic lathe limited in any way?*

A Yes, but there is such a wide assortment that the Sundstrand has found profitable application in countless metal working plants.



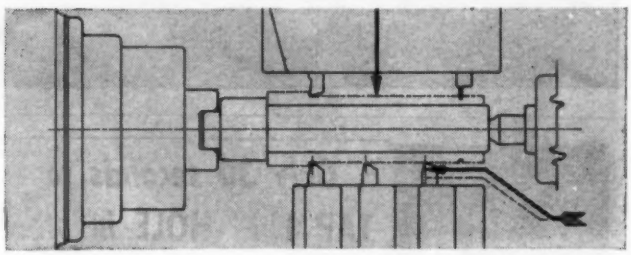
Master samples used for tooling setups.

Q *What is the smallest lot size that can be handled profitably on a Sundstrand lathe?*

A It varies and depends upon the number of cuts required and the design of the workpiece.

Q *How long does it take to set up an automatic lathe?*

A This varies with the number of tools needed and the design of the workpiece. The simplicity of the cycle changeover on the Sundstrand makes it possible to set up some jobs in thirty minutes or less.



Tooling for rough turning sleeves.

Q *How can we determine whether or not a Sundstrand lathe will be a profitable addition to our lathe department?*

A Sundstrand engineers will be glad to make an analysis of all of your turning jobs and give their recommendations as to whether new lathe equipment, of any kind, would be a wise investment. Their wide experience may prove helpful to you and there is no obligation for this service.

Q *Where can we get complete up-to-date information on how to increase production with an automatic lathe?*

A *Additional Information* on turning short-run, mass production and special turning jobs is contained in this free booklet. On-the-job illustrations as well as tooling diagrams and factual performance data are included to illustrate the time saving possibilities on turning work such as yours. Write for book 134.

ARMY E NAVY

SUNDSTRAND MACHINE TOOL CO. ROCKFORD ILLINOIS U.S.A.

SUNDSTRAND
MACHINE TOOL COMPANY

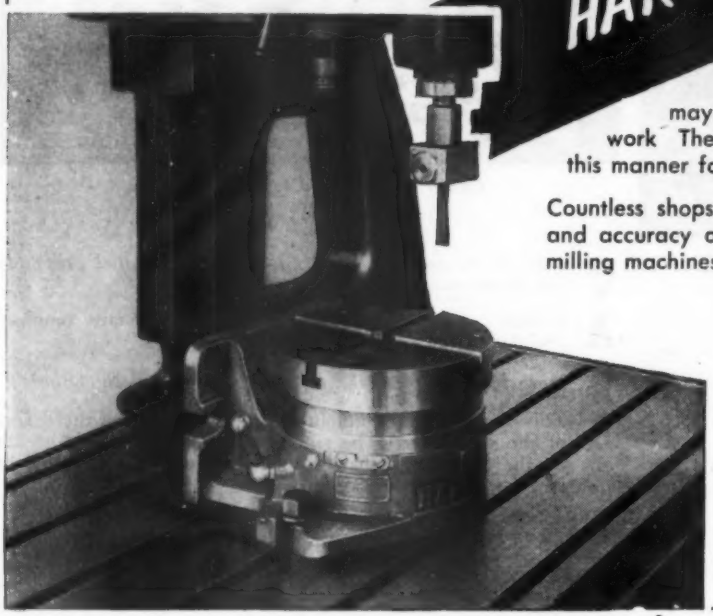
2533 Eleventh St. • Rockford, Ill., U. S. A.

FUEL UNITS • HYDRAULIC PUMPS • TRANSMISSIONS • FLUID MOTORS • VALVES and CONTROLS

PRECISE WORK LOCATION IN JIG BORING ....

assured with the

HARTFORD SUPER-SPACER



The accuracy of this modern spacing device makes it highly convenient for use on jig-boring operations. Supplementing this inherent accuracy is the facility with which a face plate may be attached and thereby provide precise location of work The Hartford Super-Spacer is shown here equipped in this manner for jig-boring.

Countless shops have availed themselves of the speed, convenience and accuracy of the Super-Spacer for a wide variety of set-ups on milling machines, drills, planers and slotters. Its adaptability is almost universal and in all cases it can be depended on for accuracy in indexing. Super-Spacer Mask Plates provide for fool-proof indexing and thereby eliminate all possibility of error even in the hands of inexperienced operators.

Get all details TODAY

The HARTFORD
SPECIAL MACHINERY CO.
HARTFORD 5, CONN.

Only 30 seconds to TAP 1¼" HOLE *in steel*

• This Cleveland Automatic Tapping Machine is tapping 1¼" diameter x 2½" deep holes in forged steel turnbuckles at Edward W. Daniel Company. It is tapping these parts 300% faster than previous method —is maintaining accuracy —and increasing tap life. The lead screw control used on this machine steps up tapping speeds — improves thread accuracy — reduces tap wear and breakage. For example—tapping class 3 threads, as many as 10,000 holes have been tapped with a single tap. This performance speaks for itself—for design and construction features—write for full descriptive bulletin.

Guide for Production Tapping — this pocket size pamphlet contains a lot of useful data on tapping — Write for your copy today.

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LEAD SCREW
TAPPING MACHINES

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Tubular welded frames with forged ends insure a maximum of accuracy with a minimum of weight.

There are a variety of types available with either micrometer heads or dial indicators to cover a range of capacities from 0 to 168 in. . . *Write for Bulletin 200* or outline your gaging problems.

• D & T Bow Micrometer 0 to 6 in. capacity

Davis and Thompson Co.
Mfrs. of Machine Tools and Micrometers
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Exact Contour Hardening

in 2/3 of a SECOND

with -MEGATHERM-*

ELECTRONIC HEAT

Here's another difficult hardening job, done simply and quickly with Megatherm.

Exact contour hardening of the inner gear of these supercharger clutch discs was done in less than ⅔ of a second each.

These gears were hardened to a depth of .050", with the hardening closely following the tooth and root contour of the gear surface, without affecting the strength or ductility of the remaining metal. The unretouched photograph above tells the story.

To do this contour hardening a jig was built to support the disc so that its inner surface surrounded a two-turn induction coil, directly connected to the output terminals of the 25 kw Megatherm.

The Megatherm automatic timer limits the heat period to exactly ⅔ of a second, then operates a solenoid which trips the disc into an oil-quench bath.

Here is another example of Megatherm's adaptability to many hardening problems involving irregular and "hard-to-get-at" surfaces.

If you have a surface hardening problem . . . whether for wartime or peacetime application . . . consult Federal's Megatherm engineers for the answer or write for complete data.

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INDUSTRIAL ELECTRONICS DIVISION

AN IT&T ASSOCIATE

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TOOLS of *Quality* for *Quantity* PRODUCTION

Noted for maintaining original accuracy over a longer period. Criterion Heads are smooth, compact, rigid. Parts subject to wear are hardened. LEAD SCREW IS HARDENED TOOL STEEL, WITH THREADS GROUND FROM SOLID AFTER HARDENING. All heads have large, graduated dial. Large offset adjustment eliminates need for offset boring bars. Two sizes: 1½" and 3". ½" and 1" bar capacity. Shanks are interchangeable, enabling operator to use head on different machines. Ideally adapted for slide boring tool holder on small turret lathes. Ask your dealer or order direct. Request free literature.

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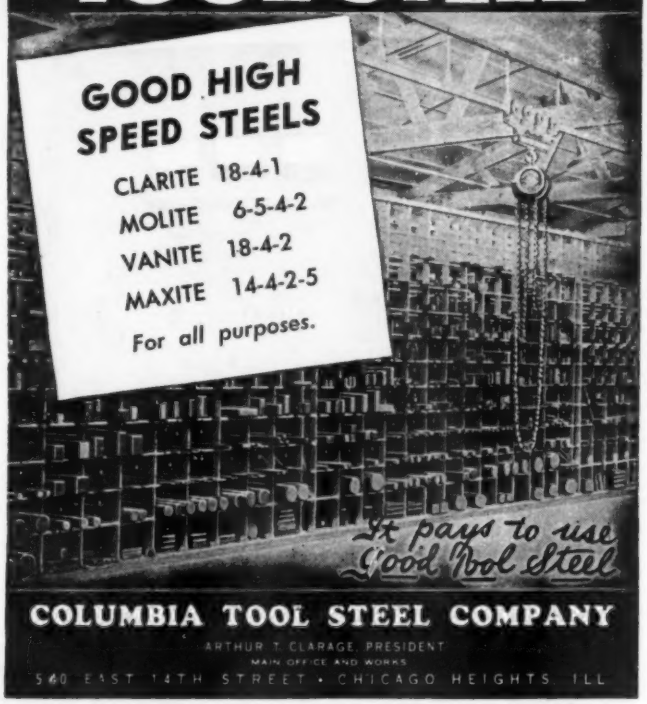
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

Columbia TOOL STEEL



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Desmond Cutter

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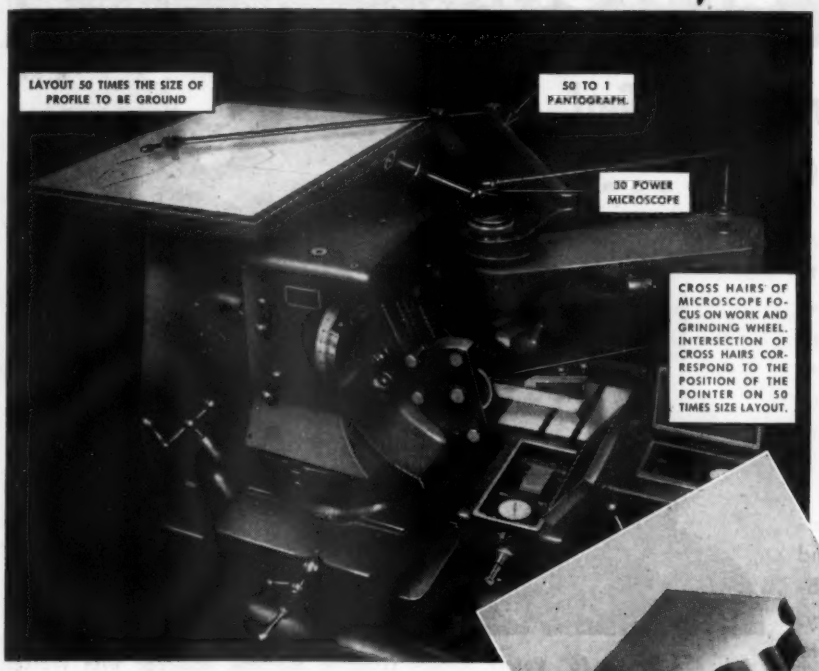
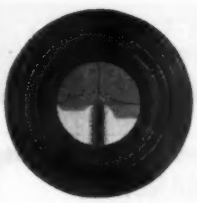
UNIQUE *Wickman Operating Principle*


LAYOUT 50 TIMES THE SIZE OF PROFILE TO BE GROUND
50 TO 1 PANTOGRAPH.
30 POWER MICROSCOPE
CROSS HAIRS OF MICROSCOPE FOCUS ON WORK AND GRINDING WHEEL. INTERSECTION OF CROSS HAIRS CORRESPOND TO THE POSITION OF THE POINTER ON 50 TIMES SIZE LAYOUT.

SAVES TIME AND MONEY

FREES SKILLED MEN

on Precision Profile Grinding



The Wickman Profile Grinder incorporates a fifty-to-one pantograph for controlling the formation of the profile, and a 30-power microscope for observing development of the profile and for accurate inspection of the work before it is removed from the machine. In operating the machine, the work table is stationary. The form is developed in stages by bringing the grinding wheel up to the point indicated by the microscope cross-hairs. On flat work, the wheel head reciprocates automatically on an adjustable vertical slide. Cylindrical work is mounted on the Circular Grinding Attachment.

With this unique, simple operating principle, any person of average intelligence can soon learn to grind the most complicated profiles to closest precision limits, releasing toolmaker skill for other work. What's more, the Wickman Profile Grinder saves up to 75% of the time required by other methods.

This machine is particularly suited to working in tungsten carbide, and will grind forms to 5¾" length, 2⅜" depth and 2" thickness.

Write today for full information on this versatile, faster method of precision profile grinding.

The WICKMAN PROFILE GRINDER

THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

A. C. WICKMAN (Canada), Ltd., P. O. Box 9, Sta. N., Toronto, Ont.

"WALKERS" at work

One of a series of advertisements showing specific machines on which Walker Magnetic Chucks are being used and the Operations being performed.

Difficult grinding jobs are simplified with WALKER CHUCKS....

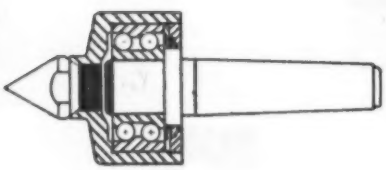
When a job like the pump driving cam shown here comes up, it will be to your advantage to consult your Machine Tool Builder or Walker Engineers. Grinding problems such as this are not necessarily difficult to solve when machine and holding device can be coordinated in such a way that set-up is simplified, fast work assured and close tolerances maintained.

Walker Chucks . . . in Electro-Magnetic and Permanent Magnetic types . . . are helping meet and solve holding problems of all kinds. Your problem may be one that is out of the ordinary. Why not find out the most practical way to handle it? *We are at your service.*

No. 25A Heald 16" Rotary Surface Grinding Machine, equipped with Walker Rotary Magnetic Chuck, grinding a Pump Driving Cam.

O. S. WALKER CO., Inc.

100 ROCKDALE STREET
WORCESTER 6, MASS.



SHORT OVERHANG

and accurate — at all speeds — *because* of short overhang and preloaded ball bearing. Point ground after assembly assures true center point.

Write for Catalog A-44

THE READY TOOL COMPANY

Iranistan & Railroad Aves.
BRIDGEPORT, CONN.

NICHOLSON *EXPANDING* MANDRELS

PROMOTE PRECISION

And, secondly, they CUT COSTS . . . two big reasons why Nicholson Expanding Mandrels are recognized as "standard" in the nation's machine shops. Set of 19 does the work of 209 solid arbors, for all bores from ½" to 7". Two types, all sizes; sold singly or in sets. Prompt delivery. Bulletin 1043.

Other Products: Traps, Control Valves, Arbor Presses, etc.

W. H. NICHOLSON & CO. 114 OREGON STREET WILKES-BARRE, PA.

"ROCKWELL" HARDNESS TESTER

These new improved type testers available from stock in all sizes.

The word ROCKWELL has been our Trade Mark for 24 years and is the mark that insures precision.

WILSON

MECHANICAL INSTRUMENT CO. INC.
357 Concord Ave., New York 54
An Associate Company of American Chain & Cable Company, Inc.

CHECK ANOTHER SUPER "FIRST"

NOW... Solid Tungsten Carbide Reamers Available from Stock!

Good news for users of small reamers! Super Tool Company now stocks solid tungsten carbide reamers in sizes down to 125". Now you can order these small size reamers and get quick deliveries without the delays that resulted when they had to be manufactured on special order

And here is more good news! Because of Super Tool's advanced manufacturing techniques these small solid tungsten carbide reamers now can be furnished on special orders in sizes as small as .09375".

Next time you need small size reamers, specify SUPER . and get the better performance, the cleaner cuts, the precision work and the greater production economies that Tungsten Carbide can bring to your cutting jobs.

Write TODAY for complete data and prices on Super Standard Solid Tungsten Carbide Reamers.

Whatever
YOUR CUTTING JOB LOOK *FIRST* TO SUPER

★

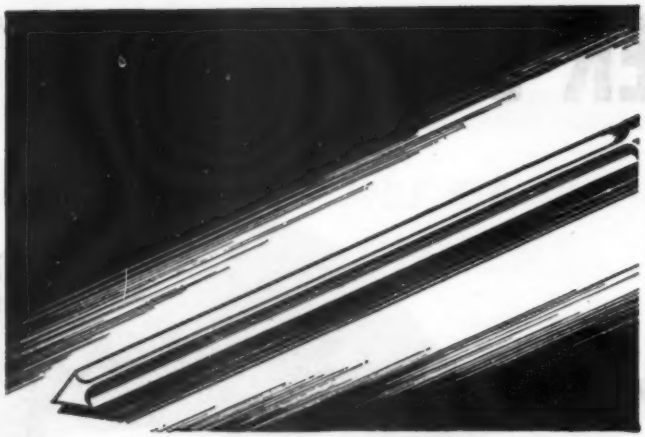
CARBIDE TIPPED TOOLS FOR

Turning, Facing
Reaming Forming
Spot Facing
Boring Grooving
Grinder Rests
Wear Parts
Counterboring
Shaving Centers and Special Purposes

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Road, Detroit 13, Michigan ★ 4105 San Fernando Road, Glendale 4, California



2000 HOLES PER REAMER

Instead of only seven!

Here is a war-production fact that sounds fantastic—yet its truth brings striking evidence of the superior performance of L & I Ground Flute Reamers, when they replace ordinary milled flute reamers.

The Oilgear Company of Milwaukee reports that with milled flute reamers they were usually unable to complete with one reamer the seven holes required in an important piece. They are now using L & I Ground Flute Reamers and are producing an average of nearly 2000 holes per reamer.

If you haven't tested the keener cutting edge and longer life of L & I Ground Flute Reamers against the ordinary milled flute reamers you are now using, why not send us a trial order —or write for literature?

L&I GROUND FLUTE REAMERS

LAVALLEE & IDE, INC.
CHICOPEE, MASSACHUSETTS

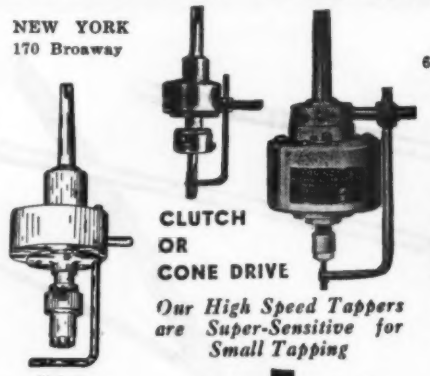
ERRINGTON MECHANICAL LABORATORY

STAPLETON, STATEN ISLAND 4, N. Y.

TAPPING CHUCKS

NEW YORK
170 Broaway

CHICAGO
6701 N. Sioux Ave.



CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

Friction
No. O O C. S.

Positive
No. O O H. S.

Style B Positive Stop Holds Work Down

Style C Graduated Adjustable Safety Friction

DRILL PRESS TURRET

Style D-E with Quick-Change Tool Holders to Drill, Tap and Set studs, etc., without moving work, or stopping or reversing machine. Individual friction adjustment in each tap-holder. If required.

Also, Opening Die-Heads; Opening Stud-Setters; Friction Screw-Drivers and Nut-Setters, etc.

RANDALL and STICKNEY
Dial Gauges and Indicators

Model C

are accurate, reliable and built to stand the gaff of hard usage.

This Model C Dial Indicator has a 2½ in. diameter dial, with 50 or 100 divisions. Can be furnished in graduations of .001-in., .0005 in. or .01 mm. Has a ½-in. range, movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units, so that repairs can be made easily.

There is a R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

RANDALL & STICKNEY
Waltham 54, Mass., U. S. A.
Makers of Dial Gauges Since 1885

CRAFTS

CARBIDE TIPPED

Consistent Quality

GAGES AND TOOLS

ARTHUR A. CRAFTS COMPANY, INC.

603 Newbury Street
at Kenmore Sq. BOSTON
DETROIT · CHICAGO

For through-arbor mounting for straddle and side-milling.....

Specify Lovejoy Type "B"

SIDE-MILLING CUTTERS

These rugged Type "B" inserted-tooth cutters are designed for long wear — the housings are made of hardened alloy steel — the blades are set to give maximum blade life, and they are *positive-locked* by the famous Lovejoy method.

The Type "B" can be furnished to your specifications with HSS, cast alloy, or tungsten carbide tipped blades. Many have been furnished with double-negative cutting angles for "hypermilling" hardened steel at incredible speeds.

The Type "B" can be made in special widths for various drives, or with certain blades omitted for fly cutting jobs.

Whether you have special or standard jobs, it will pay to consult Lovejoy on your milling cutter selection. The coupon will bring you the *complete* Lovejoy catalog which gives all data necessary to pick the right cutter for every job.

MAIL THE COUPON TODAY---

Please send me my free copy of "Lovejoy Modern Metal Cutting Tools."

NAME_____ TITLE_____

COMPANY _____

STREET _____

CITY_____ STATE_____

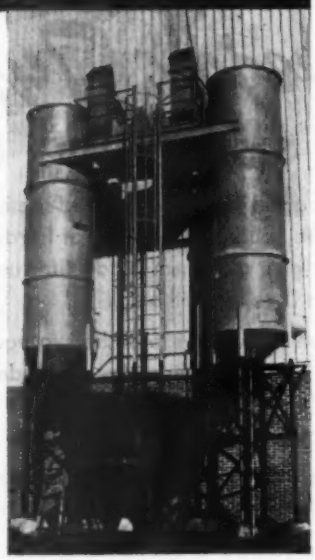
A. M.

Lovejoy TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.

MILLING CUTTERS | BORING HEADS | ARBORS | SPOT FACING TOOLS | COUNTERBORES | BORING BARS | SINGLE POINT TOOLS | TURRET TOOL POSTS

Dust and Fume Elimination Boosted Employee "Morale"

at this major aircraft plant



Hard-to-control dusts from the abrasive blast cleaning department of this large southwestern aircraft plant are completely collected and converted into harmless sludge, which is readily disposed of by two 8,000 c.f.m. Schneible Multi-Wash Dust and Fume Collectors, shown above in the background.

Other cleaning, pickling and plating operations are thoroughly ventilated by two 7,000 c.f.m. Schneible units shown at the right. Note the twin recirculating and dewatering tank serving both collectors. Accumulated sludge can readily be raked into a truck for disposal.

You can reduce labor turnover, maintain a cleaner plant and lower absenteeism due to unfavorable working conditions, by properly controlling dust and noxious fumes as only the Schneible Multi-Wash System does it! Send for literature.

Pioneers in Effective Dust and Fume Control

CLAUDE B. SCHNEIBLE COMPANY

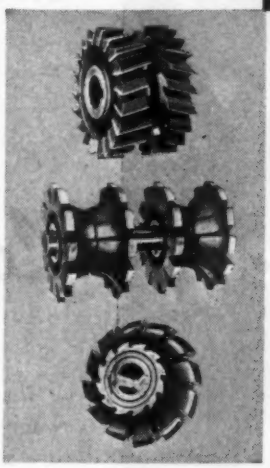
2827 Twenty-Fifth St., Detroit (16), Mich.

Offices in Principal Cities

SCHNEIBLE

"WHO'S GRANDPA?"

"THAT'S JOE. HE SAID HE WOULDN'T SHAVE UNTIL THAT A. C. E. TOOL WORE OUT."



We don't know just how fast Joe's whiskers grow but we do know that A.C.E. Special Cutting tools are so tough, long lasting and fast cutting that they do a large volume of cutting work before resharpening.

A.C.E. Special Cutting tools (made to blueprints or specifications) are available in all types—either hi-speed or carbide tipped.

Let us quote on your immediate needs—Bulletin 301 sent on request.

AMERICAN CUTTER AND ENGINEERING CORPORATION

31745 MOUND ROAD · WARREN, MICH.

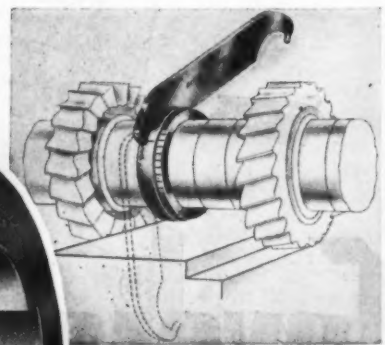
A.C.E. SPECIAL CUTTING TOOLS *HI-SPEED OR CARBIDE-TIPPED*

SAVE TIME ON YOUR GANG MILLING SET-UPS

You are assured FAST—ACCURATE spacing on all side milling cutters and gang milling setups with

DAYTON ROGERS ADJUSTABLE SPACING COLLARS

Just loosen cutter arbor nut and make plus or minus adjustment with handy wrench as shown.



"DAYTON ROGERS" ADJUSTABLE SPACING COLLARS are graduated in thousandths, with plus or minus markings as illustrated. A .0005 adjustment can easily be made by visual calibration. These collars are made in 12 standard sizes from ⅞" to 2".

Write for illustrated bulletin #120-1

DAYTON ROGERS MFG. CO.

2835 12th Ave. S. Minneapolis, Minn.

IT'S BASIC--
use of good quality tools makes a big difference in machine tool efficiency — and costs. For *all* basic cutting operations—tapping, milling, reaming, as well as drilling — always specify Morse Tools!

MORSE

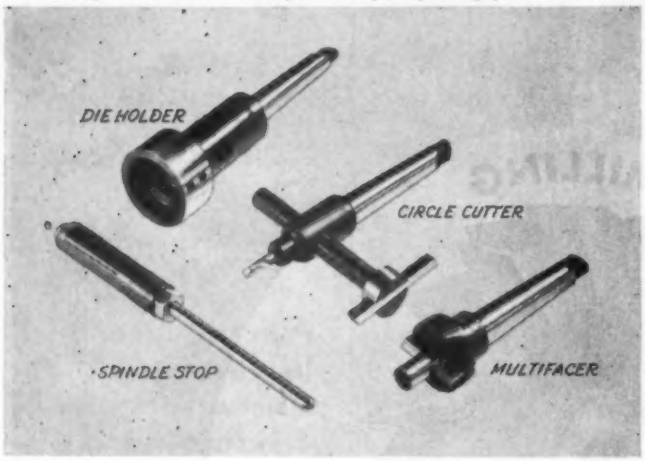
THERE *IS* A DIFFERENCE

TWIST DRILL AND MACHINE COMPANY
NEW BEDFORD, MASS., U. S. A.

NEW YORK STORE: 130 LAFAYETTE ST. - - - - CHICAGO STORE: 570 WEST RANDOLPH ST.
SAN FRANCISCO STORE: 1180 FOLSOM ST.

LOOK AT THESE TOOLS BY RIEGER

Out in your shop right now, there are jobs on which Rieger tools would be mighty useful. Look at the pictures and you'll realize how handy these tools are. You'll want some of them as soon as you get the complete information that the coupon will quickly bring you.



● **MULTIFACER.** For spot-facing, boring, counterboring, valve-seating, and cutting convex or concave annular rings. Any contour you want by grinding insert bit to corresponding shape. Cutting diameters 1" to 5" with three regular sizes of Multifacers ranging in price from $20 to $45. Special sizes made to order.

● **CIRCLE CUTTER.** For cutting 2" to 8" dia. holes in sheets of metal, rubber, plastic, composition, fibre, wood, etc. Will machine ½" plate steel. Regular model, $18. Other sizes made to order. Can furnish with two bits for cutting gaskets.

● **SPINDLE STOP.** Fits ¾" spindle hole. Won't mar wall because expansion is by collet action. Stem can be removed for positioning solid work. Price, $5.50. Other sizes made to order.

● **DIE HOLDER.** Steps for 1" and 1½" round dies. Chases true, straight threads up to ⅝" x 3". With No. 2 Morse taper shank, $13. Other shanks on special order.

REPRESENTATIVES:

Harry E. Hummer, 115 Montclair Ave., Newark, N. J.; Jack Brewer, 1151 S. Broadway, Los Angeles 15, Calif.; Schellenbach Machine & Tool Co., 480 Fifth St., San Francisco 7, Calif.; Bridge Machinery Co., 708 St. Paul St., W., Montreal, Que.

MAIL COUPON OR WRITE FOR COMPLETE INFORMATION

THE RIEGER MFG. CO., Dept.
Dept. A.M.-2 MIAMISBURG, OHIO.

Send complete information on Multifacers, Circle Cutters, Spindle Stops, and Die Holders.

Name _____

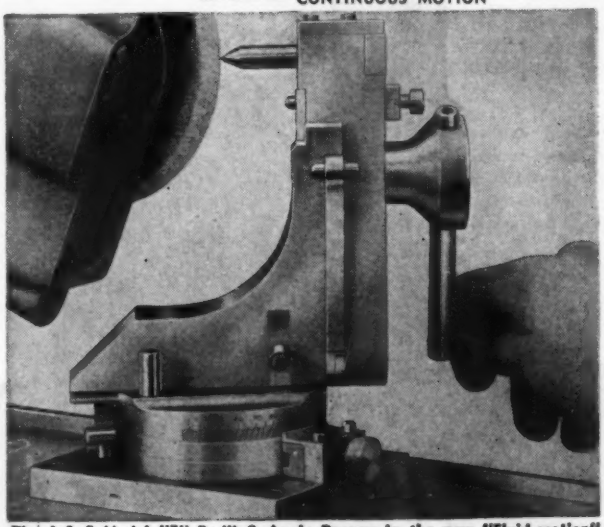
Company _____

Street Address _____

City _____ Zone _____ State _____

USE *Fluid-motion* for modern form-dressing

ONE SETTING HANDLE CONTINUOUS MOTION



The J & S Model "E" Radii & Angle Dresser in the new "Fluid-motion" series is one of the finest precision dressing instruments procurable—regardless of cost.

FEATURES

Fluid-motion dressing.
.0001" accuracy.
Automatic centering.
Chatterless and dustproof.
14" wheel capacity.
Versatile and adaptable.

J. & S. TOOL CO.
477 MAIN STREET
EAST ORANGE 1, N. J.

NATIONAL KEYSEATING MILLER

. . . the tool that converts drilling machines into key-seaters and saves time and money

● With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

WRITE TODAY FOR OUR NEW CATALOG NO. 15

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

SO MANY JOBS WITH THIS ONE STEEL

BTR TOOL STEEL

WHAT IT IS: Bethlehem Tool Room (BTR) is *the* standard general-purpose, oil-hardening tool steel of the industry.

WHAT IT HAS: A carbon-chrome-tungsten-vanadium combination that assures safe hardening . . . durable cutting edge . . . deep hardening . . . low distortion and small dimensional changes.

WHY IT'S EASY TO HANDLE: Annealed for easy machining.

Has uniform analysis and hardenability.

Simple to heat-treat.

Does not decarburize readily.

TYPICAL USES: For dies employed in the shaping, forming, blanking, punching, and shearing of both ferrous and non-ferrous materials.

For master hobs, broaches, drill bushings, knurling tools, gages, taps, and many other commonly used tools and parts.

If you're looking for *one* steel that will do *many* types of jobs, stock BTR in your tool room. It's a multi-purpose steel; you'll be amazed at its versatility. Pleased, too, at the money it saves you, both directly and indirectly. Pick up the telephone and ask your distributor for BTR.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

Bethlehem Steel Export Corporation, New York City

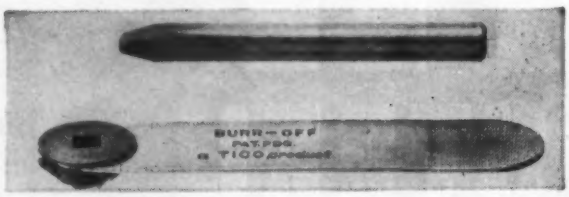
BETHLEHEM TOOL ROOM... one of Bethlehem's *Big 8* Tool Steels

UNIVERSAL
DRILL PRESS TURRET HEAD

Clamps on quill of any standard Drill Press giving operator immediate choice of three different sized drills or tools. This permits continuous operation through elimination of moving work to different presses, thus effecting a saving in time and tooling.
It is simple to attach, you merely remove the chuck and depth gauge, slip the bracket over quill, tighten, and your three-position drill press is ready. The turret is equipped with three Jacobs chucks, ¼" capacity and is designed for maximum strength and rugged use. Shifting from one position to another is accomplished by a light movement of indexing lever. Positive indexing positions are provided for long life. All parts are interchangeable and tool maintenance is extremely simple. WRITE TODAY FOR FULL INFORMATION.

The Universal Engineering Co.
2230 NATIONAL AVENUE • SAN DIEGO 2, CALIFORNIA

"BURROFF"



PAT. NO. 2351578
For fast clean removal of burrs and chamfering holes (inside & outside) of multi-walled parts—where regular solid countersinks will not reach.

CONTACT:
JOHN H. GRAHAM & CO.—105 DUANE ST., N. Y. C.
MADE BY
TOOL IMPROVEMENTS CO. — SEAFORD, NEW YORK

HARDNESS TESTER

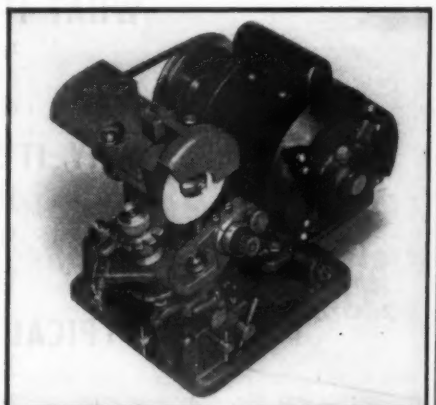
Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

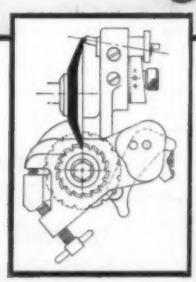
Write for Circular!

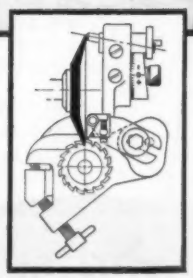
THE SHORE INSTRUMENT & MANUFACTURING CO., INC.
9025 VAN WYCK AVENUE
JAMAICA, NEW YORK
TELEPHONE: JAMAICA 6-4090

"DON'T SEND A MAN TO DO A BOY'S JOB"

Use the Small *Waltham* CUTTER SHARPENER







TO SHARPEN SMALL CUTTERS *FASTER* and more *ACCURATELY*

By keeping cutters sharp on a Waltham Cutter Sharpener, your production machinery can be kept at peak efficiency. Sharp cutters produce more work, more accurately—sharp cutters make any machine perform better. The Waltham is a bench tool—it is fast and accurate even when operated by unskilled help—it is *especially designed* for sharpening gear and thread milling cutters, straight fluted hobs and multiple cutters that are not much over 2 inches in diameter and ⅜ inches thick.

The Waltham is regularly furnished with precision index plates (left line drawing), and may be equipped with a pawl device for locating on the top or back of the teeth (right line drawing).

No machine is better than the cutting edge of the tool it uses.

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 344 which gives full details on the Waltham Cutter Sharpener.

A.M.

Name..... Title.....
Company.....
Street.....
City..... State.....

TOOL STEELS

There is probably no form of machining which Midvale has not had to utilize and develop in our own shops. Naturally we make many of our own tools and for each of them we have developed the right steel through long experience. In selecting Midvale tool steels, therefore, you are buying far more than so much metal. You are sharing in the laboratory research and shop experience of America's foremost custom steel maker.

THE MIDVALE COMPANY • NICETOWN • PHILADELPHIA

OFFICES: NEW YORK • CHICAGO • PITTSBURGH
WASHINGTON • CLEVELAND • SAN FRANCISCO

MIDVALE
Custom Steel Makers to Industry

LYNN

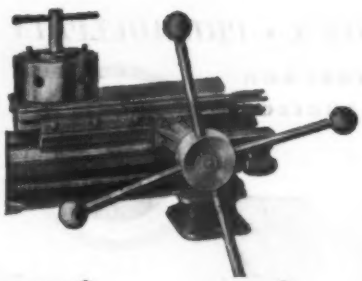
Equip Your Lathes for Immediate Turret Work

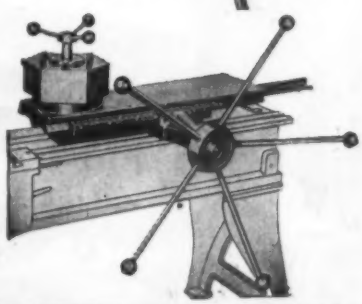
Put your idle or unproductive lathes into ***full-capacity*** production AT ONCE—without tedious and costly overhauling.

CONVERT your engine lathes for turret work—or RE-CONDITION your worn or inaccurate turret lathes and screw machines, with LYNN equipment. Easily, quickly mounted on your present lathes, LYNN units give them the speed, range and capacity of ***new turret lathes*** at a small fraction of the cost of new lathes.

We manufacture a complete line of Self-Indexing Bed Turrets, Tool Post Turrets, and other equipment for every make and size of lathe.

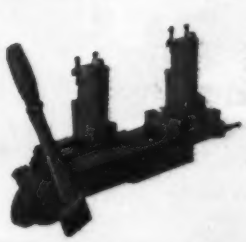
Prompt shipments . . . Write today for full information . . . or ask your jobber

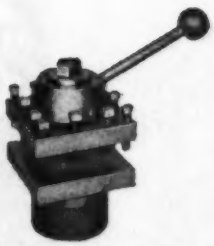


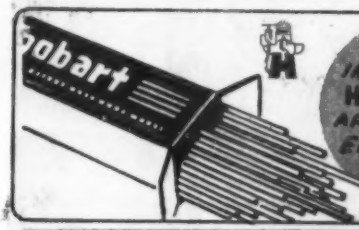


LYNN MANUFACTURING CO.

224 Elroy Street **Minneapolis 8, Minn.**







HOBART "Simplified" arc welders

"One of the World's Largest Builders of Arc Welders"

HOBART BROTHERS CO., Box A.M. 3-29 TROY, OHIO

Famous for
- ACCURACY OF THREADS
- LOW CHASER COST
- ALL AROUND DEPENDABILITY

Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt. on page 238 Jan. 18, '45, American Machinist

THE EASTERN MACHINE SCREW CORP., 29-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.

LUERS Patented Cutting Off Tool Holders Patented Cutting Off Blades

ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

Manufactured By
J. Milton Luers — 12 Pine St. — Mt. Clemens, Mich.
Produced under License Issued by John Milton Luers Patents Inc.

...for difficult operations on stringy metals—

• Time after time . . . on millions of parts machined from tough, stringy metals . . . ThredKut has proved to be the only cutting oil capable of producing required finish and tool life. This famous oil product, plus the skill of Stuart Oil Engineers, can do the job for you too. D. A. Stuart Oil Co., Ltd., 2729 So. Troy Street, Chicago 23, Illinois.

Stuart's ThredKut HEAVY DUTY CUTTING OIL

D. A. Stuart Oil CO.

ESTABLISHED 1865

FOR ALL CUTTING FLUID PROBLEMS
Stocks in Principal Metal Working Centers

Pat'd & Pats. Pend.

meet...

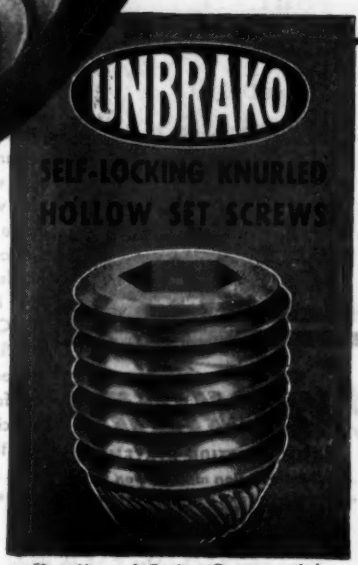
A SOLDIER ON THE HOME FRONT

Operating strictly on the offensive, the "Unbrako" Hollow-Set Screw with the knurled point has vibration licked at the start. Applied in the usual manner, the KNURLS dig in and the "Unbrako" hangs on with a grip that can't be shaken off no matter how hard the machinery vibrates, though in action day and night. . . . There's a vast army of these "Unbrako" Self-Lockers on duty in war plants all over the country and in thousands of machines, tools and implements rolling off production lines—keeping maintenance costs and worries down by infallibly holding parts together under any and all conditions. And they're good for many "engagements" because they're easily removed with a wrench—can be re-used any number of times.

Sizes: No. 4 to 1½" diameter.

Get the "Unbrako" Catalog

OVER 40 YEARS IN BUSINESS



Knurling of Socket Screws originated with "Unbrako" years ago.

STANDARD PRESSED STEEL CO.

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The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

• The Barrett Parts Drying Process centers around a method of creating a guarded cyclone.

In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

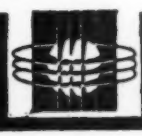
Direction of basket rotation can be quickly reversed which will change position of the load and accelerate drying. Baskets are available in shapes which experience has shown to be most effective for handling various classes of work.

It will pay to investigate the advantages offered by Barrett Centrifugal Dryers on your work.

Full Details of the Barrett Cyclone Dryer Sent Promptly on Request.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery



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without BLOWER or POWER
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ATMOSPHERIC POT HARDENING FURNACES ... tangentially-fired to assure even heat up to 1650° F. are used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

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HOEFER *Designs* SPECIAL EQUIPMENT

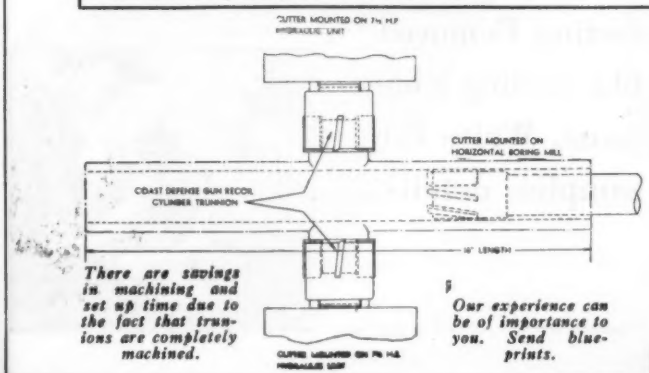
for machining a COAST DEFENSE GUN RECOIL MECHANISM CYLINDER with turning trunions . . . . . .

• This cylinder was mounted on the table of a large horizontal boring machine boring a 6-inch hole, 60 inches long. While the boring operation takes place there are two 7½ h. p. hydraulic units which turn and face the mean diameters of the true trunions.

The 7½ h. p. hydraulic units are equipped with special control valves to give rapid traverse forward—feed forward—dual return feed—return rapid traverse. Complete cycles in either direction.

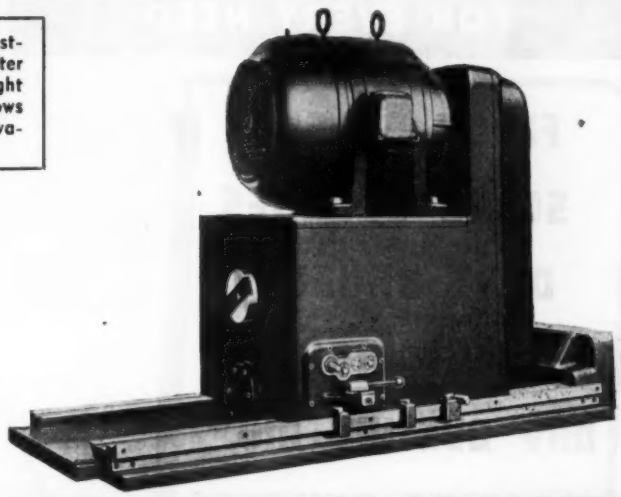
Control is provided so that hydraulic circuit can be disconnected and a feed screw on the machine base engaged. Two dials enable the unit to be moved mechanically either .010 or .001 per division on the dial.

7½ HP Unit for special purpose to cover a micrometer adjustment for a hand facing operation. When using the micrometer attachment, the ball lever shown on the gear box lower right corner, engages the screw which engagement automatically throws out the hydraulic circuit. In other words, each method of motivation is entirely independent of the other.


CUTTER MOUNTED ON 7½ H.P. HYDRAULIC UNIT
CUTTER MOUNTED ON HORIZONTAL BORING MILL
COAST DEFENSE GUN RECOIL CYLINDER TRUNNION
10" LENGTH

There are savings in machining and set up time due to the fact that trunions are completely machined.

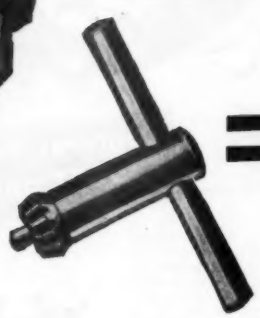
Our experience can be of importance to you. Send blueprints.



HOEFER MFG. CO. *Freeport, Ill.*

Hoefer's Whole Business is Holes . . . .

Almond Drill Chuck



The Original Manufacturers of Drill Chucks

As Pioneers in their field, ALMOND THREE-JAW DRILL CHUCKS have played an important part in machine tool development. They were the first to be placed on the market more than seventy years ago.

Types and sizes are available to fit all machine tools and portable drills.

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LEACH External Grinder

PRICE
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Write us today for your nearest dealer's name and address.

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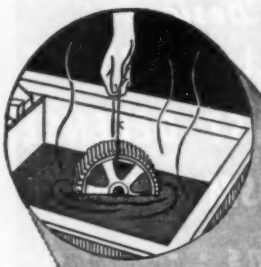
THE FULLER BRUSH COMPANY

INDUSTRIAL DIVISION · HARTFORD 2, CONN.



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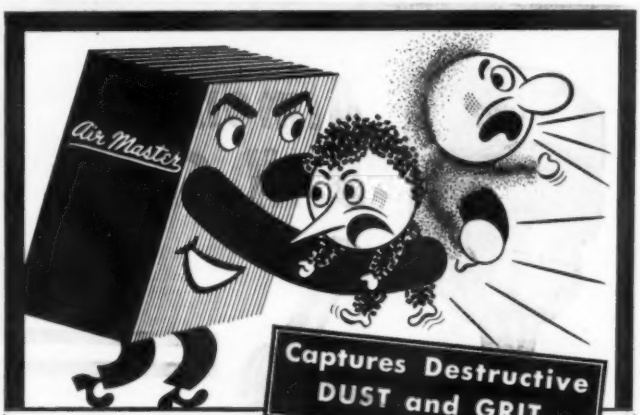

Captures Destructive DUST and GRIT

The AIR-MASTER is sure protection against the destructive dust and grit thrown off by grinders and buffers. It sucks them up right at the moment they fly off the wheels. Your employees are freed from the dangers of inhaling these destroyers of health—and the sensitive parts of your fine machinery are protected against their gritty, abrasive action.

The AIR-MASTER is fully self-contained—efficient, rugged, dependable. A size for every grinder and buffer.

Master dust and grit, install the AIR-MASTER

Write for full details

NOW AVAILABLE. Two, Three and Five H.P. grinders on AA-5 priority or better.

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ELECTRIC DRILLS · GRINDERS · BUFFERS · PORTABLE TOOLS

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DIVISION OF THE R. K. LE BLOND MACHINE TOOL CO., CINCINNATI, OHIO

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What do you see first?

Do you see the silhouettes of two engineers? Or do you see a vase-like form that they anticipate producing with a forming tool. In any case—when a cutting problem comes up the discussion is bound to turn to cutting oils.

What you don't see in a cutting oil base is its quality. Nor do you see the wetting agent that will bring the oil closer to the cutting edge—carrying away more heat. You don't see the germicidal ingredients which will cut down man hours lost because of oil dermatitis.

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SEE to it you get all three benefits. Your guarantee is this label.

CUTS COOLER . . . TOOLS LAST LONGER

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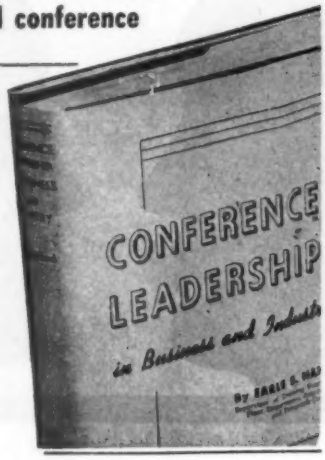
Additional territories still open to Sales Representatives. Write us at once.

Strengthen your ability to direct and handle conferences

with these straight-forward procedures for the business, training, and formal conference



So that you can make sure of directing day-to-day business, training, or formal conferences to get desired end results, learn these tested methods of handling all types of people, get these sound pointers on asking leading questions and keeping to the main discussion points, use these step-by-step procedures to make every conference hit the right mark. Not only will this book enable you to select the proper type of meeting and handling to meet a given situation but it will also show you when a conference method is indicated and which of the three possible procedures should be followed.

Just Published!

CONFERENCE LEADERSHIP in BUSINESS and INDUSTRY

By Earle S. Hannaford

Supervisor of Training Practices, Long Lines Plant Department, American Telephone and Telegraph Company

McGRAW-HILL INDUSTRIAL ORGANIZATION AND MANAGEMENT SERIES

289 pages, 5¾ x 8¾, 31 illustrations, $3.00

This book presents a general conference process, and from this develops and describes three specific conference procedures which make it possible to adjust leadership methods to various types of meetings. The author analyzes those aspects of handling people which relate conference leadership to leadership in general: basic types of questions and their use in conference leadership; frustration and inferiority, their manifestations and control; competitive element as a factor in conference participation; desirable traits of a conference leader interpreted and measured in terms of performance rather than personality.

LOOK UP:

—The Natural Step-by-Step Procedure in Group Discussion
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—Classification of People from a Conference Standpoint
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SEE IT 10 DAYS ● SEND THIS COUPON!

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Send me Hannaford's Conference Leadership in Business and Industry for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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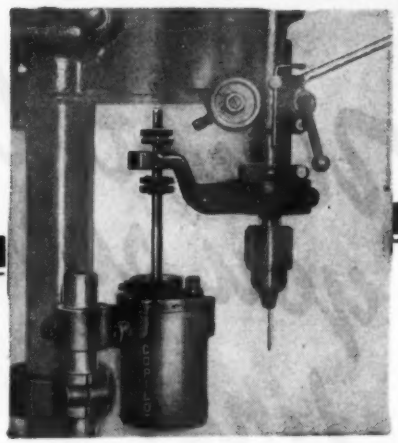
COPILOT DRILL PRESS FEED REGULATOR



Enables totally inexperienced and unskilled operators to produce good work from the start. . . . Prevents violent contact of drill with work at start of operation . . . permits maximum production . . . eliminates unnecessary drill breakage . . . controls break-through.

Horizontal model controls difficult hand miller jobs

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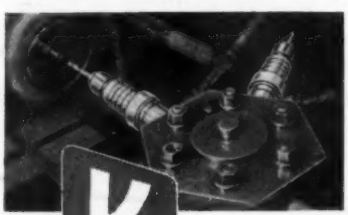
More Holes . . . Lower Cost . . . Improved Accuracy



Used on hand or automatic screw machines where drilling speed is normally too slow. Speed increase 1200 to 3500 rpm. Accurate holes with no "run-out." Keller tools do the job!

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Pneumatic Tools

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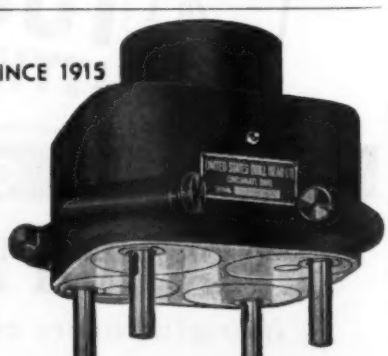
STANDARD US HEADS SINCE 1915

All Types of Fixed Center

DRILLING TAPPING & BORING HEADS



Four Spindle Head. All Spindles Adjustable for equally spaced holes.

FIVE TYPES, 56 SIZES, ADJUSTABLE DRILL HEADS

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Over 200 Machine Tools

BERGEN MACHINE & TOOL CO., INC.
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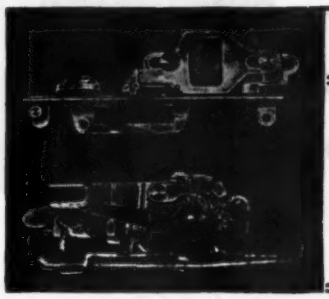

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We can make long or short runs in any metal. Our modern equipment and methods, backed by 50 years of experience, are your guarantee of satisfaction. Our manufacturing facilities also include screw machine products, tools, dies, jigs and fixtures.

Your order is assured of quality workmanship by skilled mechanics. We will furnish prompt quotations on your blueprints or samples. Write us today!

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METAL STAMPINGS
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We solicit your blueprints or samples for quotation. No obligation of course.

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WIRE AND METAL SPECIALISTS
In round, flat, square and special shaped wire in all metals.
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Plating and finishing.
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HIGH PRODUCTION
MILLING — DRILLING — GRINDING
24 hr. service on
TOOL AND CUTTER GRINDING
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BUILDERS OF SPECIAL MACHINERY TOOLS & DIES

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AVAILABLE SCREW CAPACITY
¼ to 4½ Automatic and Hand Screws
Including Necessary Secondary Operation
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For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them.
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Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.
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Lucas THE LAST WORD IN REBUILDING MACHINE TOOLS

In this modern plant your worn machinery gets a new lease on life » » » » »

YOUR best assurance of getting a difficult job done well is to take it to a specialist. By experience, training and intention, J. L. Lucas & Son, Inc. are specialists in rebuilding machine tools. The large, modern plant you see above was designed for this one purpose, and encompasses all we have learned about quality rebuilding during forty years of performing this service for leading manufacturers in this country and abroad. You can very easily put our 52,000 square feet of floor space, specialized precision equipment and skilled craftsmen to work reconditioning your production machinery.

THIS is the first of a series telling the Story behind the Lucas nameplate on Machine Tools.

Send for our complete illustrated booklet "Rebuilding the Lucas way"

LUCAS of BRIDGEPORT

J. L. LUCAS & SON, INC. BRIDGEPORT 5, CONN.

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MACHINE DESIGNER

Exceptional opportunity in a modern, progressive machine tool plant for a machine designer with practical and technical background on medium machinery. Write for personal interview enclosing brief outline of experience to the Chief Engineer.

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METALLURGISTS—for positions in Bureau of Mines, Naval shore establishments and War Dept. arsenals. Salaries, including overtime pay, range from $2,433 to $6,228. Full information and application forms at first and second-class Post Offices or United Civil Service Commission, Washington 25, D. C.

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MECHANICAL ENGINEER—Old established company now converted to pre-war production (Essential Products) has opening for mechanical engineer with some machine design factory layout and installation experience. Excellent future possibilities. Give complete details of personal qualifications and work history in letter of application. Address P-956, American Machinist, 330 W. 42nd St., New York 18, N. Y.

DRAFTSMAN EXPERIENCED with drawing dies, tool and jig layout, post-war positions, excellent conditions. P-164, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

TOOL AND diemakers experienced with drawing dies for post-war position, excellent conditions; give full particulars. P-163, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

WANTED

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Must be thoroughly experienced with all types of manufacturing: Die Casting, Production Line Assembly, Etc. Plant located in Metropolitan N. Y. Excellent Opportunity! Permanent Post-War Position! WMC Regulations apply. Give complete record of Experience, Qualifications and salary desired.

P-228, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

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SPRING MAKER in short order department. High wages. Now on war work but post-war work and position assured. Give full details of qualifications, prior experience, age, and references. P-230, American Machinist, 330 W. 42nd St., New York 18, N. Y.

WANTED ESTIMATOR—An old, well established tool shop in Northern Ohio desires the services of a man thoroughly capable of estimating jigs, fixtures, gages, dies, special machinery. Position permanent. Should you have this ability, write giving full background as to experience, education, draft status, and former positions held. Compensation open. Write P-236, American Machinist, 330 W. 42nd St., New York 18, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 35 years recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details. R. W. Bixby, Inc., 366 Delaware Bldg., Buffalo 2, N. Y.

(Continued on page 246)

ANOTHER TYPICAL ENGINEERED REBUILDING JOB

by Simmons

PRODUCTION LIST

ITEM NO. 6697 — BLDG. NO. — FOREMAN

DESCRIPTION Lipe Carbo-matic Lathes — DEL'Y PROMISED

PART NO.	QN.	DESCRIPTION	MATERIAL	TO BE MADE BY		REMARKS
1		Plane Bed, Scrape & Frost				
2		Machine Carriage, Scrape & Fit				
3		Machine Toolslides, Scrape & Fit				
4		Machine Cross Slide, Scrape & Fit				
5		Weld Broken Tool Slide				
6		New Tool Plates For Tool Slides				
7		Machine Tailstock, Scrape & Fit				
8		Check All Motors				
9		Check All Electric Switches				
10		Replace All Wire Bearings				
11		Replace All Bad Oil Seals				
12		Check Hydraulic Systems				
13		New Gibs For Tool Slide				
14		New Gibs For Carriages				
15		New Gears Where Needed				
16		New Roller - Cross Slide Feed				
17		New Stud - Roller				
18		New Nuts & Screws For Cross Slide				
19		Fit New Tooling Supplied by Customer				
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SIMMONS MACHINE TOOL CORPORATION
1759 NORTH BROADWAY, ALBANY 1, NEW YORK

MANUFACTURERS OF STANDARD AND SPECIAL-PURPOSE MACHINE TOOLS · ENGINEERED REBUILDING **SIMMONS**

SEARCHLIGHT SECTION

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10 cents a word minimum charge $2.00.

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POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.

PROPOSALS, 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

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The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A. M. March 28th will appear in the issue of April 12th subject to limitation of space available

PERSONNEL DIRECTOR WANTED

By old established Company normally employing approximately 1000 in building high grade machinery. Location New York State.

Plant is modern, Company's policies progressive and there is opportunity in congenial surroundings for the right man whose qualifications should include years of successful experience in this field, progressive ideas, sound judgment, ability to assume responsibility, and personality to attract and get along with people.

Business now operating on important war work but has complete line of nationally known products for postwar and normal times.

This is permanent position coordinating all personnel work, including Employment, Labor Relations, Training, Athletic Activities, Safety and Welfare work, Group Insurance and Benefits, etc.

Give full particulars including experience and salary expected.

Correspondence considered confidential.

P-225, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N.Y.

WANTED
MECHANICAL ENGINEER

In light metal stamping and screw machine work.

ALSO

EXPERIENCED DRAFTSMAN

Good opportunity in old established company. Give full particulars as to experience and salary desired.

P-190, American Machinist
520 North Michigan Avenue
CHICAGO 11, ILLINOIS

WANTED
MACHINE DESIGNERS

Experienced on the design of special machinery. Excellent opportunity for first class men interested in steady positions in New England.

Only men 35-55 with a record of successful achievements will be considered. In replying furnish information preliminary to a conveniently arranged interview.

P-140, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED
TOOL DESIGNER

Long established company in a New Jersey city 35 miles from New York, requires the services of a tool designer who is able to design without supervision. This is a permanent position with good opportunities. Write full particulars in first letter giving age, experience, lengths of service, and salary expected.

P-215, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

WANTED FOR ENGINEERING DEPARTMENT

Machine designers, layout men and detailers familiar with design of medium and heavy machinery. State qualifications. Location—Midwest City.

P-227, AMERICAN MACHINIST
520 North Michigan Avenue
Chicago, Ill.

(Continued from page 244)

POSITIONS WANTED

MECHANICAL ENGINEER with 28 years' executive experience. Successfully filled such capacities as Chief Engineer, General Superintendent and Works Manager. Well versed in modern manufacturing methods and equipment. Past connections with large well known concerns producing such products as sewing machines, machine tools, automobiles, aircraft and aircraft engines. Responsible position desired in Eastern location. PW-219, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER EXECUTIVE—Wants permanent position with reliable firm. Experience in metal fabrication and machine operations; industrial engineering; tool and welding engineering; product engineering and development; labor problems and supervision; and management organization. PW-231, American Machinist, 330 W. 42nd St., New York 18, N. Y.

INDUSTRIAL ENGINEER available from motor city. Wishes position with progressive concern. Extensive experience as master mechanic, chief inspector, production superintendent, process engineer, plant layout, tool design and tool making. Prefer Mid-Western location. PW-232, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PRODUCTION ENGINEER—Supervisor, is increasing operating efficiency through analysis, standardization, planning and control of methods, tooling, quality, costs and production, based on 12 years experience in interchangeable manufacture. Graduate M.E. Permanent position only. PW-233, American Machinist, 330 W. 42nd St., New York 18, N. Y.

POSITIONS WANTED

ACCOUNTING-MECHANICAL Executive. Man with 16 years experience in machine shop and toolroom work and 12 years experience as a public accountant, seeks a position with a well-financed company where his past experience will be valuable. Organization, managerial and instructional training experience. Efficiency minded. Free to travel. Detailed experience upon request. PW-234, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

MECHANICAL ENGINEER experienced on design and manufacture of special and automatic machinrey, jigs, fixtures and dies: production and methods engineering, expediting and quality control of product, desires responsible position with post-war prospects, no board job considered. PW-235, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SALESMAN AVAILABLE

BRITISH MACHINE Tool Engineer, Age 39, wishes to represent American Machine Tool manufacturer in British Isles and Continental Europe. 23 years' experience with leading British Machine Tool manufacturer—demonstration, sales and service throughout Europe. Three years resident Sales and Service Engineer in Scandinavian countries. Last ten years travelled British Isles as specialist Sales Engineer. SA-217, American Machinist, 330 W. 42nd St., New York 18, N. Y.

REPRESENTATIVE AVAILABLE

WANTED: 26 years machine tool experience in Indiana. Would like allied or repeat business. RA-211, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

PATENT ATTORNEY

PATENTS, COPYRIGHTS, Booklet, "General Information concerning Inventions and Patents" and "Free Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington 5, D.C.

PHYSICAL FITNESS

READ AIM . . . the illustrated monthly magazine for all those interested in Industrial Physical Fitness. Covers all phases sports, recreation, promotion, management. Special offer 7 issues $1.00 plus free 34 page Personal Physical Fitness Guide. Write AIM Magazine, Clinton, 24, South Carolina.

WE WILL BUY

a going industrial business for cash, and for our own account. Prefer a transaction involving over $100,000.00.

Write to
Industrial Division
TRIPLEX MACHINE TOOL CORP.
WORLD-TELEGRAM BLDG.
NEW YORK 7, N. Y.

Additional Wanted Advertising on page 253

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

MORE VALUE FOR YOUR MONEY

• • • OUR INVESTMENT IS YOUR SECURITY
• • • SOUND RECONDITIONING

EXCEPTIONAL ITEMS FROM OUR MODERN STOCK*

SHEARS & BRAKES

Lennox Splitting Shear, 8' throat, ¾" cap., arr. M.
Lennox Bevel Shear, ¾" cap., arr. M.D.
Niagara #98 Brake & Folder, 72" cap. 14 ga. arranged M.D.
Niagara #216 Circle Shear.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging 4" stroke (2).
#4½ Bliss 3 column B.G. 3" stroke.
#5 Bliss D.C. B.G. Forging 3" stroke.

BORING MILLS

100" Niles-Bement-Pond Bor. & Turn. Mill.
48" Gisholt Vertical Boring & Turning Mill.
54" Colburn Vertical Boring Mill.
#36 Landis-Rochester 3½" bar, floor type, horizontal Boring Mill. Floor Plate 72"x 120".
42" Bullard Vertical Boring Mill with side head; New Era Type.
No. 31 Lucas Horizontal Boring Mills 3".

DRILLING MACHINES

Bickford 4-spindle Rail Drill, #4 M.T., Table 20"x67". Arranged motor drive.
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.
Leland Gifford 2 spindle.
Woodward & Rogers 6 spindle.
Fosdick 13", 4 spindle (2)
Fosdick 13", 2 spindle

RADIAL DRILLS

2½' Cincinnati-Bickford 9" round column, motor driven, Radial Drill.
3' Dreses, 9" Rd. Column.
4' Arm 11" Col. Cincinnati Bickford.
5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
6' Arm 14" Col. Cincinnati Bickford
3' 9" col. American, S.P.D.

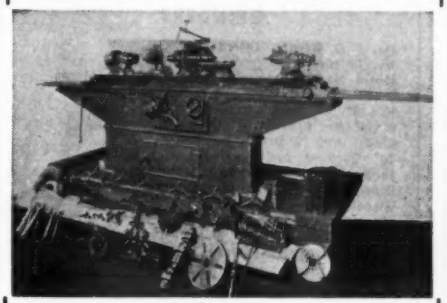
MULTIPLE DRILLS

Fox #15H 54 spindle hydraulic feed.
Natco #D-5, 10 spindles #1 M.T.

GRINDERS

16" Heald Rotary Surface Grinder.
#4 Brown & Sharpe Universal Grinder.
#2 Cincinnati Centerless Grinder.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump. 15" swing, 5" hole, 4" dee.
Oliver Model 51 Drill Grinder; 1½" cap.
Pratt & Whitney 14x36 model B vertical surface grinder.
14"x36" Cincinnati Cyl., motor driven
6"x32" Norton Cyl., overhead c/s drive

Brown & Sharpe No. 4 Univ. Cylindrical Grinder, M.D., with regular equipment.



Capacity:—Centers swing 12" dia.; over water guards 10¾". Distance between centers 60". Takes wheels to 12" dia.x½" to 1" thick. Longitudinal Table travel — 10 changes in rate; range 1½" to 53 " per minute. Work speed—6 changes for live or dead center grinding. B & S No. 9 taper hole.

MILLING MACHINES

#3, #4 & #5 Cinn., High Power, Plain, S.P.D.
No. 0 Bickett Vertical Bench Miller
No. 2 Cincinnati, High Power, Plain.
No. 2 Brown & Sharpe, Plain (4).
No. 1½ Brown & Sharpe, Plain (2).
#1 Kempsmith Universal, Cone Drive.
No. 1 Brown & Sharpe, Plain (6).
Ames Precision Universal Bench Mill.
P & W 2½" Duplex Spline Miller.
Hall Planetary Thread Miller 24".
No. 8 Lees Bradner Thread Miller

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" N.-B.-P., Planer Shaper, M.D.

LATHES

Putnam 26 x 12 Heavy QCG, arr. for M.D.
American, 16 x 6 Q.C.G., Geared Head
Hendey, 16 x 10 Q.C.G., Turner M.D.
Potter & Johnston #6A Automatic Chuckers; 3½" dia. hole in spindle (2).
Seneca Falls Tool Room 14 x 6, Q.C.G.
20 x 10 Lodge & Shipley, G.H., M.D., Taper Att. (2).
16" Warner & Swasey Fox Brass (2)
16" Dreses Fox Brass
16"x8' Lodge & Shipley 12-speed geared head, motor drive.

SHAPERS AND GEAR CUTTERS

26" Cincinnati Triple Geared, Belt Dr.
#61-2 Fellows 36" Gear Shapers
12" Schuchart & Schutte Gear Hobber.
#1 Adams Gear Hobbers, Belt driven (3).
14" Rockford crank shaper
20" Gould & Eberhard crank shaper
14" Rockford Shaper.

BENDING ROLLS

Stoll 4' x 4½" Power Slip Roll cap. 10 ga.

SLOTTERS

Betts 36" Geared Slotter, Motor driven, 54" dia. Rotary table.

MISCELLANEOUS

Lacquer Heater with acquistat, J. C. Miller Co.
Heat Treating Furnaces for the tool room.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Blake and Knowles 12x2x12 Simplex Type, Hydraulic Steam Pump, 2000 lbs. pressure with 80 to 125 lbs. steam, delivers 9 gallons per minute.
#228C Greenlee Vertical Hollow Chisel Mortizer, Power feed, M.D.
No. 7B High Speed Riveting Hammer, cap. ¾" to 1½". New this year.

HEADQUARTERS FOR POWER PRESSES

**The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.*

BUY FROM STOCK
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FALK MACHINERY COMPANY

Machinery Merchants

18 WARD ST.
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CLOSEOUTS

BORING MILLS
HORIZONTAL

2½", 4" Binsee
4" Landis Horiz., Floor Type, M.D.

VERTICAL

66", 120" Niles
42" Bullard, M.D., 54" Colburn, M.D., 2 hds.

TURRET LATHES

Nos. 2A, 3A W.&S., 4½" hole, M.D.
24" Gisholt, 6½" hole
Foster Nos. 4, 5, 6, 1B, M.D. Univ.
J. & L. 2¼x24", 3¼x36"

GRINDERS

P. & W. 14", 18", B.B., Vert., M.D.
Blanchard 30", M.D.; Modern 12x48", M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 55, 70, 72A3 Gagematic, M.D
Norton 50"x28', M.D.
Gardner 72' disc, M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
Nos. 50, 55, 60 Heald Int. Hydraulic, M.D.
B. & S. No. 3 Univ., No. 11, S.P.D.
16" Heald Rotary, M.D.
B. & S. No. 2 Surface, M.D.
Norton 10x36" Hydraulic, M.D.
Badger 24" Dbl. Opposed, M.D.

LATHES

McCabe 26-42"x14'
24x12' Boye & Emmes 3 step cone, D.B.G.
20"x14' Rahn-Larmon, raised to 24"
14"x6' Hendey
9" LeBlond Automatic
36x30' Putnam, M.D.
36x30' Putnam S.C.G., D.C.M.D.
36"x30' LeBlond, M.D. 32"x35' Wickes
Putnam 42x16', M.D.
30x26' L. & S. 12 speed M.D.
21x14' Sidney Q.C.G.
84"x28' Niles Bement Pond, 17' centers

AUTOMATICS

5 Spdle. Davenport ½" cap.
New Britain 1⅝x7", 6 spindle Tim. Bear.
Cleveland Model A ½", ⅝", 1¼", 2"
Cleveland Model B 1", 2"
Cleveland ⅞", Model M, 4 spindle
Gridley 4¼" single spindle, M.D.
P. & J. 6A, M.D.

GEAR CUTTERS

No. 2, 3 12 Barer-Colman Gear Hobber
No. 6 Fellows Gear Shapers
B. & S. No. 3-26", 4-36"
Gleason 11" Bevel

SHAPERS

20", 24" G. & E., 20" Ohio, M.D.
16", 20", 26" Stockbridge

RADIALS

4', 7', 8' American Triple Purpose
5' Dreses Full Universal
3', 3½' Cincinnati-Bickford
4' Mueller, M.D.; 4', 5' Western, S.P.D.

MILLING MACHINES

Ingersoll Planer type 36x36x12' 4 hds., M.D.
10" P. & W. Auto.
No. 2A Milwaukee, S.P.D.
No. 3S Cincinnati, S.P.D. rapid trav., M.D.
Nos. 1Y, 0Y, 3, 4, 5 B. & S. Plain & Univ.
B. & S. Nos. 12, 13, 13B
Hall Planetary Model D Thread Miller
Providence Planer Type 32"x8'
Becker Nos. 3, AB, 5, 6 Vert.
Nos. 3, 4, Cincinnati Vert.
P. & W. No. 12, 30 Profiler, M.D.
No. 4 B & S. Universal
Rowbottom Cam Miller
K. & T., B. & S. No. 3 Dbl. overarm, Timken Bearings
B. & S. No. 2, 3, Vert.
Milwaukee No. 2½B Vert.

MISCELLANEOUS

10'x⅜" Geo. Ohl Shear, M.D.
Gorton, IS Engraving Machine
6 spindle Avey Drill, 15" overhang
800 ton coining press: McCabe ½" Flanger
Rochester No. 5B Hammer
Pels 6" Vert. Shaper
Pipe Machines, 4", 6", 8", M.D.
N.B.P. 15" Slotter, M.D.
Baush Multiple spindle drill
Burr Keyseater
⅝"x5' Plate Straightening Roll
4x4x⅝" Williams & White Angle Bending Roll

AARON MACHINERY CO.

MONA MEMBER

45 Crosby St.
New York 12, N. Y.

MILES QUALITY TOOLS

AUTOMATICS

⅞" and 2" Cleveland "B"
1¼" & 1¾" Gridley 4-spindle "F"
4½" Gridley 4-spindle chucking, Model H
No. 454 New Britain, 4-spindle chucking
7" Baird 6-spindle chucking
14"x19" Fay automatic lathe

DRILLS

Sensitive, all makes and types
20", 21" & 24" Cincinnati upright
20" Barnes box column mfg.
22" Barnes 2-spindle all grd, self oiling
3½' American radial
4' Western radial, Timken bearing, M.D.

GEAR CUTTERS

Nos. 7 & 21 Fellows shapers
No. 16HS Gould & Eberhardt hobbers
No. 1 Lees Bradner hobbers
64"x20" G & E spur gear cutter
26"x8" G & E spur gear cutter
11" Gleason straight bevel, segments & Gears
15" Gleason spiral bevel pinion and gear roughers
18" Gleason bevel testers and lappers
8" Red Ring spur gear lapper
Cimatool "Peerless" gear shamferers
Lipe 2-spindle gear shamferer

GRINDERS

No. 1 G Greeby Internal
No. 75 Heald Internal
Heald No. 72 automatic electric sizing internal
6"x18", 12"x36", 16"x36" & 16"x52" Landis
10"x36" & 10"x50' Norton
8"x24" No. 1 Brown & Sharpe universal
6"x20" No. 10 Brown & Sharpe
20" Gardner semi-automatic disc grinder
Ingersoll face milling cutter grinder, type EN85
Cincinnati face milling cutter grinder
Gisholt tool grinder
16"x48" Landis crankpin grinder
No. 60 Heald & No. 6 Landis cylinder grinders
No. 10 Blanchard surface

FORGING EQUIPMENT

No. 2B Nazel air hammer, motor driven
No. 1 Evans Ajax taper forging roll
3" Acme upsetter (forging machine)

LATHES

12"x8' Sebastian
14"x6' Mulliner
15"x6' Sebastian
18"x8' Hendey
18"x8' Sidney
24"x12' Boye & Emmes
28", No. 3B Foster turret
22" & 26" Libby turret
8" & 12" Sundstrand Stub
15" Sundstrand automatic Stub

MILLERS & BORING MILLS

2½" Universal horizontal mill
No. 3-B Milwaukee vertical miller
No. 3 Reed Prentice vert. miller & die sinker
Nos. 2 & 3 Kempsmith plain
Nos. ½ & 2 Van Norman plain
No. 12 Brown & Sharpe Mfg. elec. drive
No. 3 Sundstrand bed type mfg miller
48" Oesterlein tilted offset miller
42" Ingersoll continuous rotary
Type C Hall planetary thread miller
48" Newton C66A cont. rotary
No. 3 Lees Bradner thread
4" Rise Barton double spline
48" Cincinnati automatic

SHAPERS & PLANERS

16" Gould Eberhardt shaper
16" American shaper
16" Steptoe shaper
24"x24"x6' Wood Powell planer
36"x36"x10' Hamilton planer
60"x60"x35' Gray planer

MISCELLANEOUS

6" Bignall-Keeler pipe threader
2" Landis pipe machine
3" Acme bolt threader, Landis head
6"x6" Hilles-Jones angle shear & Turn table
No. 7 Greenard arbor press, practically new
Arcade jar molding machine
Cleveland sand cutter
4" Stevens die slotter. New 1941

SEND FOR COMPLETE LIST

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EASTERN OFFERS FROM STOCK

AUTOMATICS

4 spindle ⅝" Cleveland Model M, m.d.
2¼" Cleveland Model A, m.d.
4 spindle 2¾" Cleveland Model K, m.d.
2¼" Gridley Single, m.d.
2½" Cleveland Model A, m.d.
3¼" Gridley Single Spindle, m.d.
4¼" Cleveland Model A, m.d.
6" Cleveland Model A, m.d.
No. 6A Potter & Johnston, m.d.
No. 6C Potter & Johnston, m.d.
No. 6D Potter & Johnston, m.d.
No. 22 New Britain, m.d., tapping spindle
No. 23 New Britain, tapping spindle
No. 33 New Britain, m.d. tapping spindle

HORIZONTAL BORING MILLS

5" bar Niles Floor Type Horizontal, m.d.
3½" bar Rochester Floor Type Horizontal, m.d.
2¾" bar Sargent Floor Type Horizontal
No. 0 Fosdick Horizontal, table type, 3" bar
No. 21 Lucas, 2½" bar
3½" Betts, m.d.
4" bar Detrick & Harvey Floor Type, m.d.
4" Niles Table Type, m.d.
4½" Niles, m.d.
5½" Niles, m.d., table type, with extra circular table

VERTICAL BORING MILLS

24" Bullard New Era, m.d.
36" Bullard New Era, m.d.
42" Colburn, m.d., 2 swivel heads
48" Cincinnati Rapid Production, 1 turret, 1 swivel head
48" Putnam Car Wheel Borer, belt, with facing attach.
60" Niles-Bement-Pond, m.d., 1 swivel, 1 turret head
10' extended to 16' Betts, m.d., 2 swivel heads
12" Niles, m.d., thru gear box, 2 swivel heads

BROACHING MACHINES

75 H.P. LaPointe Horizontal Hydraulic, m.d., latest type, cap. normal pull 37½ tons, max. stroke 150", cutting speed variable, 2-17' per minute
Colonial Single Ram Hydraulic model VAS-5-42, m.d., cap. 5 tons normal, 16,800 lbs. peak capacity, 42" stroke, latest type
New Cincinnati Mill Broach, 10" spindle dia.
No. 2 LaPointe of Hudson Screw Type, belt
No. 2 LaPointe, belt
No. 3 J. N. LaPointe Double Spindle, belt
No. 4 LaPointe of Hudson, gear box

MULTIPLE SPINDLE DRILLS

No. 2 Baush, hydraulic, 16x30" head, equipped with 12 spindles
No. 2 Baush, mechanical 16x30" head equipped with 8 spindles
No. 3 Baush, mechanical, 16x30" head, equipped with 12 spindles
No. 3 Baush, mechanical, 16x30" head, equipped with 15 spindles
No. 11 Pratt & Whitney, 14x9" head, equipped with 10 spindles
No. 16 Fixed Center Foote-Burt fixed cluster 8 spindles
No. C20H Natco Hydraulic, 30" round head, equipped with 16 spindles No. 4 Taper, 2⅝" dia.
No. 26C Fox Tapper, 17x35" head, 50 No. 1 spindles
3 spindle Rockford 12" Gang, m.d.
4 spindle Harrington H.D., 13'6" rail
4 spindle Foote-Burt Rail

More than 1,000 machines in stock for immediate shipment. Send us your inquiries.

New York Branch Office — CHRYSLER BLDG.

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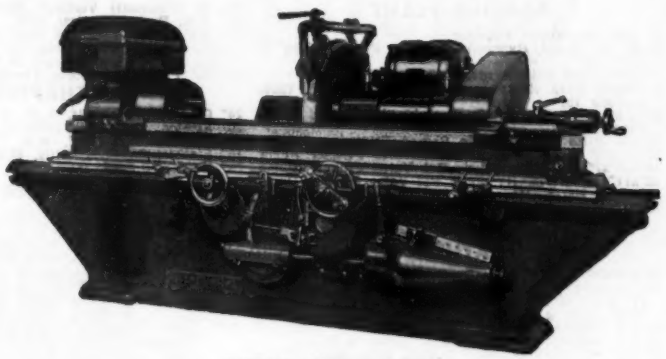
CINCINNATI 29, OHIO

HILL-CLARKE
Modernized
CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH



SIZES AVAILABLE

10x24	14x36	16x50
10x36	14x50	16x72
10x50	14x72	18x96
10x72	14x96	18x120
10x96	16x30	18x168

Hill-Clarke Modernized and Motorized Cylindrical Grinders offer refinements in design which minimize vibration and assure extreme accuracy on all grinding operations. One of these refinements, the Hill-Clarke patented Multiple V-Belt Drive to work spindle, contributes to the smoothness in operation which makes possible a finish within a few micro-inches even when using standard grain free-cutting wheels.

Send for a copy of our catalog "Super Grinding."

Have you any NORTON grinders you wish modernized and motorized?

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD **CHICAGO 6, ILL.**

16-A Fellows Gear Shaper

36" Bullard New Era Vertical Turret Lathe

#2 Brown & Sharpe Universal Grinder 14" x 30"

14" Pratt & Whitney Model "B" Vertical Surface Grinder, 25 hp motor-on-spindle

Many more. Send us your inquiries.

HAZARD BROWNELL
Machine Tools

350 Waterman St., Providence 6, R.I.

Dexter 8880

MISCELLANEOUS MACHINES

1—36"x36"x12' Cinci. Dbl. Housing Planer 2 rail hds., 1 side hd., D.C. m.d.

1—56"x56"x18" Cinci. Dbl. Housing Planer with 3 hds. D.C. vari. speed m.d.

1—6' Niles Pl. Radial Drill, rebuilt, gear box, A.C. m.d.

1—12"x18" Cinci. Rebuilt Plunge Cut Grinder, 18"x9" face wheel, A.C. m.d.

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#3H K & T Sliding Head Vertical Millers, M.D.
1—5' American triple purpose plain radial drill, motor on arm.
#4 Cincinnati High Power Plain Miller, S.P.D.
6' American Triple Purpose Plain Radial Drill, M.D.

HEAVY DUTY MACHINE TOOLS

52" Bullard Vertical Boring & Turning Mill.
54" Colburn Vertical Boring & Turning Mill.
60" Gisholt Vertical Boring & Turning Mill.
60" Betts Vertical Boring & Turning Mill.
5' American Triple Purpose Pl. Rad. Drill.
6' American Triple Purpose Pl. Rad. Drill.
6' Cincinnati Bickford Plain Radial Drill.
7' Cincinnati Bickford Plain Radial Drill.
#4 Cincinnati High Power Plain Miller, PRT.
42" Bullard New Era Vertical Turret Lathe.
#5 Cincinnati High Power Plain Milling Machine.

GRINDERS

12" x 96" Landis Plain, S.C.
18" x 85" Landis Plain Self contained.
#51 Oliver Drill Grinding Machine.

GEAR MACHINERY

18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#1 Adams Gear Hobbers.
#1 Schuchart & Schutte Gear Hobber.

PLANERS

96" x 96" x 36' Cincinnati 4 Hds. M.D.

CINCINNATI MACHINERY & SUPPLY CO.

217 East Second St., Cincinnati, Ohio

Grinder, 10' Bridgeport, Knife
Lathe, 20"x10' L. & S. Grd. Hd.
Miller, Universal, #2 Cincinnati, M.D.
Miller Vertical, #3 B. & S., S.P.D.
Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Press, Forging 1000 Ton United, St.-Hyd.
Shaper, 20"-24"-32".
Shaper, 36" Morton, Draw Cut
Straightener, Sheet 42 W-F M.D.

West Penn Machinery Company

1210 House Bldg. **Pittsburgh, Pa.**

OTT MACHINERY SPECIALS

AUTOMATICS, Acme, 9/16" Mod. C 5 spd., M.D.
AUTOMATICS, Acme 2 & 3" Mod. B 4 spindle, M.D.
AUTOMATICS, Gridley, 9/16, ⅞ & 1¼" Mod. G.
AUTOMATICS, Cone, 1¼ & 1½" 4 spindle
AUTOMATICS, Gridley, ¾, 1¼, 1⅝, 2¼" & 2⅝" Model F, M.D.
AUTOMATICS Gridley, 2¼, 3¼, & 5¼" S. S.
AUTOMATICS, Cleveland, 1¼ 1½, 2½ & 3½ Model A, M.D.
AUTOMATICS, Cleveland, ⅞, 1¼, & 2" Mod. B
AUTOMATICS, Cleveland ⅞, 1¼ & 1½" Mod. M
AUTOMATICS, New Britain #22 & 24 Chuckers
AUTOMATICS, New Britain, 1⅝ & 2½" 6 spdle., Bar, M.D.
AUTOMATICS, Potter & Johnston #5a & 6a
BORING MILLS, 30" Bullard, M.D.
BORING MILLS, Rockford, 3¼" bar, Horizontal, 24x72" table, M.D.
DRILLS, High Speed, B. B. 1 to 6 spindles
GEAR HOBBERS, 12 Barber-Colman, M.D.
GEAR SHAPERS, #7 High Speed, M.D. & #6.
GRINDER, Brown & Sharpe #2 Universal M.D.
GRINDER, Brown & Sharpe #5 Plain, M.D.
GRINDERS, Cincinnati 12"x18" Plunge Cut
GRINDERS, Bryant #3 Internal, M.D.
GRINDERS, Rivett #103 Internal, M.D.
GRINDERS, Diamond Surface #2, M.D.
GRINDERS, Landis Hydraulic, 6x18" M.D.
GRINDERS, Pratt & Whitney, 14" Vertical Surface, M.D., 9x31" Magnetic Chuck
LATHES, American 14x6' & 20"x8', M.D.
MILLING MACHINES, #2 B. & S. Universal, M. D.
MILLING MACHINES, #2B Rockford Universal, M.D.
MILLING MACHINES, Becker Vertical #5 & 6
PLANER, Ohio 42"x42"x12' One Head, M.D.

OTT MACHINERY SALES, INC.

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PRICED EXCEPTIONALLY LOW FOR IMMEDIATE DELIVERY

FORGING PLANT

5" Ajax Horizontal Upsetter
2—R. D. Wood Hydraulic Forging Presses—2500 & 3000 Ton
2—Horizontal Bolt Headers—1" & 1½"
7—Steam Drop Hammers—100, 500, 600, 1100, 1500, 2—2000 lb.
2—#57 & 1—#37 Toledo Straight Side Geared Trimming Presses
#73½ Bliss Straight Side Geared Trimming Press
25"x5"x18" Horiz. Hydraulic Pot Valve Plunger Pump
16"x26"x7"x18" Horiz. Hyd. Pot Valve Plunger Pump
22"x11"x18" Horiz. Hydraulic Pot Valve Plunger Pump
18"x4"18" Horiz. Hydraulic Pot Valve Plunger Pump
R. D. Wood Accumulator 32" dia. x 18" stroke, 600 gal. cap.

LATHES

48"x80"x24' bed Fifield, D. B. G.
30" Houston, Stanwood & Gamble. Blocked to 58" x 17' M.D. 10 HP Motor with grinding attachment and other parts Q.C.
36"x 4' Engine Lathe, B.G. M.D.
36"x18' Schumacher & Boye Q.C. Lathe, M.D.
20"x22' Whitcomb-Blaisdell D.B.G. Q.C. M.D.
22"x16' Prentice Geared Head, Q.C.G. S.P.D. M.D.
24"x12' Putnam Blocked to 28"x12' D.B.G. M.D.
16"x32"x8' Fay & Scott Gap Lathe
16"x8' Pratt & Whitney, M.D.
13"x22"x5'x8' Barnes Gap Lathe Standard Change
14"x20" No. 9 Leblond Multi Cut S.P. Geared Head
2—30"x14' N.B.P. G.H. M.D. Taper Attach.
1—36"x16' N.B.P. G.H. M.D. Taper Attach.
1—42"x18' N.B.P. G.H. M.D. Taper Attach.

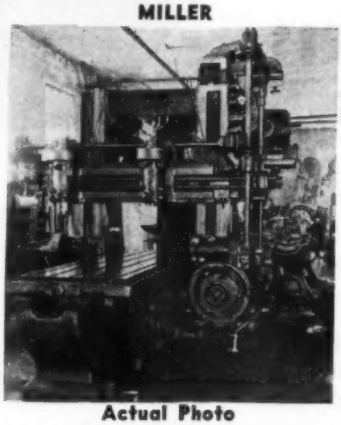
MILLERS

2—No. 5 Cincinnati Hi-Power Universal, S.P.D.
No. 4 Cincinnati Universal, 3 step D.B.G. M.D.
No. 4 Cincinnati Hi-Power Plain S.P.D.
No. 4 Cincinnati Plain, 3 step D.B.G. M.D.
No. 4B Brown & Sharpe Plain, S.P.D. M.D.
No. 4 Milwaukee Pl. Standard Knee Type Horiz. M.D.
No. 3 Cincinnati Plain Miller, D.B.G.
No. 3 Cincinnati Vertical Hi-Power
No. 3K Milwaukee Plain, M.D. Dial Type 1939 Model
No. 3½ Pratt & Whitney Duplex, Geared P.F. to table M.D.
No. 3 Van Norman, S.P. 1942 Model
Model C Becker Vertical, P.F. to rotary table, M.D.
No. 2 LeBlond Plain Back Geared, M.D.
Pratt & Whitney Automatic, P.F. to table
No. 12 Brown & Sharpe Prod., M.D.
No. 7 Becker Lincoln type
No. 2 B. & S. Universal
No. 2 Brown & Sharpe Vertical, P.F. to table M.D.
No. 00 Cincinnati Vertical, M.D.
No. A.B. Becker Vertical, S.P.
No. 0Y Brown & Sharpe P.F. to table
1—No. 3 B&S Milling Machine
1—No. 2A D.&S. Universal M.D.
12"x48" Pratt & Whitney Thread Millers

SHAPERS

24" Gould & Eberhardt, B.G. M.D.
20" Steptoe, Gould & Eberhardt, Hendey M.D. S.P.
18" Juengst, Springfield, M.D.
16" Flather, Smith & Mills, M.D.
20" Hendey S.P. M.D.

MILLER



Actual Photo

36"x36"x10' Ingersoll 4 Head Miller, Planer Type with adjustable rail, adjustable heads & adjustable spindles

AUTOMATICS

Nos. 00-0 & 2 Brown & Sharpe
New Britain 1⅝" 6 Sp.
No. 23 New Britain Chuckers, 5½"
4—1¾" Gridley, M.D.
1—6 Sp. 2½"x9"

BORING MILLS

Sellers Vertical, 100" M.D. 1931
Niles Horiz. 2¾"

GRINDERS

10"x48" Norton Surface, M.D. 1942 Model
Pratt & Whitney Vertical, 14", M.D.
Bridgeport Knife Grinder, M.D.
Springfield Vertical, S.P. M.D.
No. 70 Heald Internal, M.D.
Heald Rotary, 9' Magnetic Chuck, M.D.
No. 11 Brown & Sharpe
No. 2 Brown & Sharpe Surface
No. 4 Gallmeyer & Livingston Universal Tool & Cutter M.D.
Taylor & Fenn Internal, Cushman Chuck
No. 1G Abrasive, Internal

PLANERS

24"x24"x5' Pond, 1 Head, Cone Driven
36"x36"x15' Niles-Bement-Pond, 4 heads, M.D.

PRESSES

No. 60¼ Power, 1200 ton, 22" Stroke, 75 HP. Motor
2—Watson-Stillman Hydraulic 600 & 1000 Tons
Farnham Hydraulic, 250 tons, 4 Post, 4" Dia.
MISCELLANEOUS SMALLER TYPES AND SIZES IN STOCK

POWER SHEARS & BRAKES

Adlerhurst Punch & Shear, 1"x8", 25" Throat
Pels Punch & Shear No. 20
1—8' Niagara, 14 Ga. Gap
1—8' Stoll
1—12' All Steel Brake, ¼ cap.

MISCELLANEOUS

William Laidlaw 30" Bandsaw, M.D.
Oliver 30" Bandsaw, M.D.
Robinson Power Press Brake 8' 16 Gauge
3 Head Bliss Metal Forming Rolls, Heavy Duty
3 Head Rafter Metal Forming Rolls
5 Head Duplex Metal Forming Rolls
No. 0 Baird Header Machine, motorized
No. 2 Waterbury Header
36" Corrugated Machine
Acme Bolt Cutter, M.D. 1½"
10" CAMPBELL CUTAMATIC, 1943

TURRET LATHES

Bardons & Oliver, 4" M.D.
Gisholt Tilting, 24" Swing, M.D. 6"
Smur & Kamen 1¼" M.D.
1—No. 4 W&S Universal
B&S No. 6, 2" Capacity
4"x34" J&L, Steel Head, 1938

RADIAL DRILLS

6' Cincinnati-Bickford, S.P. 16" col.
4' Dreses, 4 step cone
3' Cincinnati-Bickford, S.P., 9" col.
3' Niles, 10" col., D.B.G., M.D.

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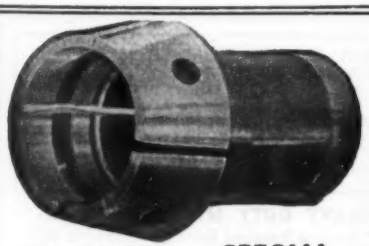

ACME No. 515, No. 52, No. 53, No. 54, No. 55, No. 56.
ACME-GRIDLEY 1⅝".
Cleveland ⅞" to 2½".
Cone 1¼", 1½", 2½".
Foster No. 1, No. 2, No. 3, No. 4, No. 5, No. 7.
Gridley, Models F, ¾", ⅞", 1¼", 1⅜", 2¼", 2⅜", 3¼", 4¼".
Model "G" Gridley, ⅞".
No. 4 & No. 6 Warner & Swasey.
Bardons & Oliver, Brown & Sharpe, Davenport, Garvin, and New Britain.
Change Gears, Lead Cams, Form Cams, No. 53 to No. 56 Acme.
Form & Lead & Cut-off Cams for ⅞" G. Gridley.
Spindle gears, finger holders, collet tubes, push tubes, spindles, nose pieces for 2⅜" F. Gridley.
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SPECIAL
Master Collets and Master Feed Fingers for 4" Cone Automatics.

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84" Niles-Bement-Pond, 28' long, 17' centers, 72" geared face plate DC drive
32"x35' Wickes Grd. Hd., M.D.
36"x30' LeBlond Grd. Hd., M.D.
36"x30' Putnam Grd. Hd., M.D.
42"x16' Putnam, M.D.
36"x22' New Haven Geared D.C. M.D.
30"x26' Lodge & Shipley 12 speed Geared Head, M.D.

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FOR SALE

2—6A Potter & Johnston Automatic Turret Lathes. Bought rebuilt from P&J in 1936. Both have hardened and ground ways. These tools are in good operating condition, complete with tools and available with dust proof motors and V-belt Drive. Can be shown in operation. Available immediately.

BROWNING MFG. CO., Inc.
MAYSVILLE, KY.

4" Bar Lucas Horizontal Boring Mill, M.D.
5" Bar Newark Horizontal Boring Mill, 8' bed, M.D.
3—#7 Fellows Gear Shapers, M.D.
#17 Barbor Coleman Heavy Duty Gear Hobber, can take a hob up to 5¾" dia., M.D.
10x30 Norton O.D. Grinder, self contained, 10 yrs. old
8" Bullard Mult Au Matic, 12 spindle
#40 Cross Gear Tooth Rounder, M.D.
#3, #4 Horiz. and Univ. Milling Machines, M.D.

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PRICED TO SELL QUICKLY

DRILLS

RADIAL: 6 ft. AMERICAN UNIV., Box table, M.D.
4 Ft. AMERICAN No. 4 M.T. 11" col. G.M.D.
3 Ft. FOSDICK, No. 4 M.T. 10" col. P.F.
3 Ft. AMERICAN, Maxi-Speed Sensitive, motor on arm
FLOOR: 34" BARNES, Back geared, No. 4 M.T. P.F.
32" PRENTICE, No. 5 M.T. P.F. 3¼" spindle, M.D.
16" AVEY, No. 2 M.T. 12x13" table
14" HENRY & WRIGHT, No. 2 M.T.
No. 12 NATCO MULTIPLE SPINDLE, with 12 spindles, M.D.
6 spindle LELAND GIFFORD, No. 2 M.T.
4 spindle BARR, B.B. No. M.T.
2, 3 and 4 sp. AVEYS, 8" overhang, M.D.
4 spindle Adjustable Rail MOLINE HOLE HOG, 12x42"

PLANERS

DOUBLE HOUSING

60"x60"x18' POND, 2 heads on Rail, M.D.
60"x44"x12' GRAY, 4 heads M.D. with 20 HP Motor
44"x36"x12' GRAY, 2 heads on rail

SCREW MACHINES

No. 652 NEW BRITAIN Auto. Chucking, 6-sp. S.P.D., 2½" cap.
2—2½" GRIDLEY S.S. Auto. G.M.D.
No. 2 BROWN & SHARPE TURRET FORMER, Motor Drive.

SHAPERS & SLOTTERS

72" MORTON DRAWCUT SHAPER, 18' travel
14" OHIO SHAPER, Single Geared, with c/s
14? Prac. New NEWTON SLOTTER, 30" table, M.D. 24" thr.
3—No. 7A DOUGLAS VERTICAL SLOTTERS, 7" str.
BETTS SLOTTER, 9" stroke, 21½" dia. grd. Rotary table, P.F.

GRINDERS

INTERNAL: No. 72 HEALD SIZEMATIC, Hyd. feed, motor drive
2—No. 52 GREENFIELD HYDROIL, Hydraulic feed, Ball bearing spindle
CYLINDRICAL: 8x30" MODERN, self-cont. coolant pump.
No. 22 LANDIS, 12"x34"; 6x32" NORTON
SURFACE: 15x15"x96" NORTON M.D.; A.C. motor, coolant pump and pan; 2 mag. chucks
TOOL & CUTTER: No. 1 WILMARTH & MORMAN, belt drive; with Univ. Grinding att.
2—No. 1 WILMARTH & MORMANS, M.D., head and tailstock.
UNIVERSAL: No. 12 Cinc. 12x36" self-cont. M.D.
BATH 10" swing, P.F. belt drive

MILLS

PLAIN: No. 4 LEBLOND, Hvy. Duty 16x68" table, M.D.
No. 4 CINC. 16½"x64" table, M.D.
No. 2 BROWN & SHARPE, Heavy, P.F. 4 step cone
No. 2 HENDEY NORTON, Back grd. P.F.
NEWTON KEYWAY MILLER, 11x44" table, P.F.
THREAD: 6x72" & 6x48" PRATT & WHITNEY, M.D.
No. 3 LEES BRADNER
UNIVERSAL: No. 1 KEMPSMITH, Div. Hd. Vise
No. 1B KEARNEY & TRECKER, 9x36" table
VERTICAL: Pract. new No. 08 CINCINNATI
No. 2 BROWN & SHARPE, B.G. 10x36" table
No. 2½-B KEARNEY & TRECKER, 14x70" table
VERNON Hi-Speed, 6"x21" table

LATHES

FLOOR: 51x22' FITCHBURG, Internal Face Plate Drive; D.B.G.; Loose change gear; M.D. 8' bed extension
30"x16' FIFIELD, L.C.G., BG, Motor drive
30"x12' LEBLOND, Q.C.G. 2½ hold, M.D.
16"x8' L.C.G. with 4 jaw chuck
16"x6' L. & S. Q.C.G. Dbld. back grd. taper att.
16"x6' PRATT & WHITNEY, grd. hd. S.P.D. with taper attachment
16"x7' BLAISDELL, L.C.G. Back grd. M.D.
14"x6' L. & S. Q.C.G., with taper att.
14"x6' LEBLOND Q.C.G.
14"x6' BRADFORD, Grd. M.D.
14"x4' LODGE & SHIPLEY, back geared
12"x8' L. & S. TOOL ROOM, relieving & taper att.
2—12"x6' L. & S. TOOL ROOM, actual swing 15"
8" SUNDSTRAND STUB, Single pulley drive, P.F.
30' PIT LATHE, Face plate 156", Internal face plate drive
PIT LATHE, 86" swing over ways, 115" between centers
TURRET: No. 4 W. & S., 1½" capacity, B.G. P.F.
4—No. 2-A Warner & Swasey, motor drive.
No. 1 WARNER & SWASEY, motor drive
28" NILES-BEMENT-POND, 4¼" hole, P.F. M.D.
No. 16 GISHOLT SIMPLIMATICS, 21" & 23" swing, S.P.D.
No. 6 B. & S. Fric. Hd., 2-1/16" hole, B.G., M.D.
No. 7 FOSTER UNIVERSAL, Motor drive
No. 3 WOOD; No. 2 BARDONS & OLIVER
JONES & LAMSON GRD. HEAD, AC Motor drive. 2¼"x24" Bar feed; 2¼"x24" CHUCKERS (2)

INTERSTATE Machinery Co., Inc.

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Most of these Machines NEW in 1940 or later!

1—4" "Universal" Horizontal Boring Mill, 96" x 60" high. Weight about 39,000 lbs.—New March 1942

2—#12 B & S Milling Machines—New March 1942

2—W. F. Barnes Horizontal Deep Hole Drills. Capacity 1¼x16"—new 1940

1—Logansport Vertical Slotter—New 1940

1—2-Spindle Morey Profiler—New 1941

1—#S-1 Gisholt Dynetic Balancing Machine—New 1942

1—#100 Mi-cro-matic Honing Machine —New 1943

1—#7 Buffalo Automatic Bar Shear—New 1941

1—#ME-1 De Walt Abrasive Cut-Off Machine—New 1942

3—#000 B & S Automatic Millers—New 1939

1—#12 Dumore 1 HP Tool Post Grinder, 100/1/60 practically new

1—52"x⅛" Pawtucket Mfg. Power Squaring Shear

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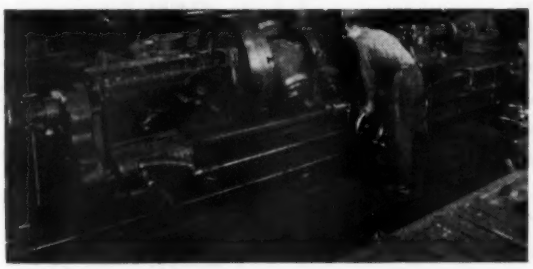

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36" Gould & Eberhardt Single Cutter Automatic Gear Cutter, suitable for jobbing work, being replaced by Hobber now in in use. Price—$500.00 f.o.b. cars Cleveland. Delivery immediate.

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84" King Boring Mill
2—Spindle No. 2 Avey Drill, M.D.
No. 5 Cincinnati Plain Mill, S.P.D.

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WOODWARD & POWELL 36"x30"x8' Metal Planer, 1 rail head, 1 side head.
POTTER & JOHNSTON 15" Shaper, M.D.
MARVEL No. 8 Metal Cutting Band Saw, cap. 18" x 18".
MILWAUKEE No. 2-B Double Over-Arm Plain Miller, Motor Drive.
Available Immediately. Also many other tools

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Dependable Used Machines

BULLARD 24" Vert. Turret Lathe—with side head; R.P.

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GLEASON 3", 6", 11" Bevel Gear Generators—2 tool type

GLEASON 10" Spiral Bevel Gear Generator

GLEASON 15" Spiral Bevel Gear Generator

INGERSOLL 24" Cutter Grinder

INGERSOLL 26"x26"x12' Planer Type Miller

P. & W. 6"x14" Thread Millers

SAUNDERS 8-18" Pipe Threader

TREADWELL 12" Pipe Machine

LATEST TYPE MACHINE TOOLS — Built in 1942

DEFIANCE #25-A Horiz. Boring Mill—3¾" bar

GLEASON 12" Straight Bevel Gear Generator

GLEASON 3" Straight Bevel Gear Generators

MOREY No. 2G Plain Turret Lathe—1" cap.

MOREY No. 3 Univ. Turret Lathe—1½" cap.

MOREY No. 12M 2 spindle Vertical Profiler

ALL MOTOR DRIVEN AND INCLUDING 3 phase, 60 cycle, 220 volt, A. C. motors

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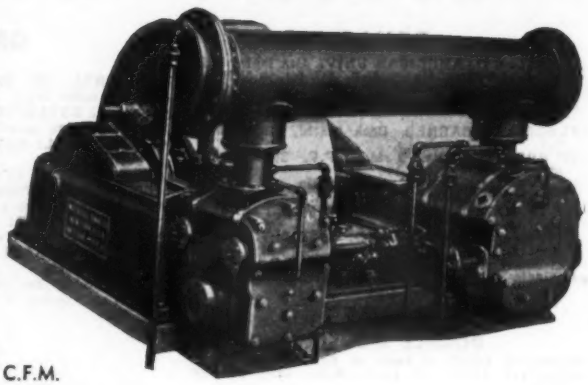

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2—Model AA-12 2½" x2½" Quincy (new)

1—Ingersoll Rand Gas Engine 105 C.F.M.

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AUTOMATICS: Br. & Sh. #2 Screw
AUTOMATIC: Conomatic 4 Sp. x 1¼" Cap. (1936)
AUTOMATICS: (3) Cleveland Single Sp. ⅝"—1¼"—2½"
AUTOMATICS: (2) Gridley Single Sp. 3¼". 4¼" Cap.
DRILL PRESSES: (2)—3 Spindles #1 Morse-Prentice, Reed
DRILL PRESS: Foote-Burt #25—24" #5 Morse
GRINDER: Bryant #16 Chucking (1943)
GRINDER: Centerless Zephyr #2 (NEW)
GRINDER: Landis Plain Cyl. Type C, 10" x 18" Hyd. (1941)
GRINDER: Landis Brake Drum 23" x 36"
GRINDER: Pratt & Whitney Vertical 8" Chuck
GRINDER: Red Head Heald, New, 12,500 RPM
LATHE: Hendey Yoke 13" x 5' Quick Change, Taper
LATHES: (2) Adams Short Cut Geared Head 14" x 4'
LATHE: McCabe G.H., 42" x 25' Q.C., H.D.
LATHE: LeBlond 19" x 6' HD. QC
LATHE: Hendey Yoke 14" x 6' Q.C.
LATHE: Willard 14" x 36" centers Q.C.
LATHE: Seneca Falls 12" x 5'
LATHE: Monarch 14" x 8' Q.C.
MILLER: Vertical #2 K.M. Milwaukee (1941)
MILLER: Plain Horiz. #3 Le Blonde, Vert. Att.
MILLER: Plain Horiz. (#1) #26 Becker Brainard
MILLER: Hand-Whitney #6 (2)
MILLER: Milwaukee #2 Universal Q.C.
PIPE: Cut-Off—3" Hurlbert-Rogers
POWER PRESS: ALL Sizes
PLANER: (2) Woodward Powell 30" x 30" x 10', 1 hd, 2 hds.
PUNCH & SHEAR: Kane & Roach #3
RADIAL DRILL: Morris 3', 9" column (1940)
RADIAL DRILL: Carlton 3' Cheap
RIVETER: Counter Sinker Farnham, hyd. (1944)
RIVETER: Townshend H.S.
RIVETER: Grant Spinner H.S.
RIVETER: Hanna Pneumatic 30 ton
SAWS: Band, Kalamazoo, Metal (NEW)
SAW: Wells #5 Metal Band 5" x 10"
SHEAR: Eyebeam Pelz T 36 H.D.
THREAD MILLER: Plan-O-Mill 8" Int. Ext. x 31" long (1943)
THREAD MILLER: (2) Hansen-Whitney, 7½" x 11½" (1936)
TURRET: B & O ¾" Hand Screw, bar feed mot.
TURRET: 2A Warner & Swasey 3⅛" (1941)
TURRET: B & O 3½" collets Univ.
TURRET: Pratt & Whit. #1 Hand Screw
TURRET: #4 W. & S. Geared head
WELDER: Arc Larkin 250 amps (New)
CHAIN BLOCKS: All sizes New
SHAPERS: 16", 20" B.G.

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BROOKLYN, N. Y.
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MDNA MEMBER

BORING MILLS—(Vertical)

38" Colburn, Gear Box, Single Turret Head, for motor drive. (late model.)
42" Gisholt, 1-swivel head, 1-Turret head. Motor 3/60/220 volts.
60" Niles, 2-swivel heads, Link belt, four speed Transmission, for motor drive.

BORING MILLS—(Horizontal)

3-A. Detrick & Harvey, 6" bar, for motor drive.

PLANER

72" wide x 84" high x 14' Gray, Heavy pattern, for motor drive.

PRESS—Knuckle Joint

1500 Ton, 29 Bliss; stroke 4", 40" bet. Hsgs.

TURRET LATHES

2-A Warner & Swasey G.H. Universal, 3⅛" hollow spindle, 3-jaw chuck, Ser. #189985. Reconditioned.
26"x7½" Libby-International G.H., P.R.T., 22" 3-jaw Univ. Chuck, Taper Attachment. For motor drive, Ser. #C-7-7312.
1½" Milholland, Geared Head, S.P.D., P.F. to turret, bar feed and collets; hand cut-off.

GALBREATH MACHINERY CO.
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EX-CELL-O
Thread Grinder
Internal—Style 39A
New—1944—Used—2 Months
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ADVERTISERS INDEX

	Page
Abrasive Machine Tool Co.	208
Acme Machine Tool Co.	46
Adams Co.	182
Aeronautical Products, Inc.	201
Allied Products Corp.	254
Allis-Chalmers Manufacturing Co.	17, 32
Almond Mfg. Co., T. R.	239
Aluminum Co. of America	49
American Chain & Cable Co., Inc.	202
American Cutter & Engineering Corp.	230
American Screw Co.	156
American Tool Works Co.	20, 21
Ampco Twist Drill Co.	128
Apex Machine & Tool Co.	214
Armstrong Blum Manufacturing Co.	86
Armstrong Brothers Tool Co.	52
Atlantic Screw Works	156
Avey Drilling Machine Co.	207
Baker Brothers, Inc.	203
Baldwin Southwark Div. Baldwin Locomotive Works	205
Barber-Colman Co.	74
Barnes, W. F. & John	75
Barnes Drill Co.	193
Barrett Co., Leon J.	238
Baumbach Manufacturing Co., E. A.	190
Beatty Machine & Manufacturing Co.	186
Behr-Manning Corp.	212
Bethlehem Steel Co.	233
Bilgram Gear & Machine Works	184
Blake Co., Edward	234
Blanchard Machine Co.	70
Blank & Buxton Machinery Co.	154
Brad Foote Gear Works	173
Braun Gear Co.	222
Bristol Co.	156
Brown & Sharpe Mfg. Co.	35, 162
Bryant Chucking Grinder Co.	73
Buckeye Brass & Mfg. Co.	164
Bullard Co.	81
Burke Machine Tool Co.	198
Cadillac Gage Co.	135
Campbell Division, Andrew C., Amer. Chain & Cable Co., Inc.	202
Carboloy Co.	153
Carlton Machine Tool Co.	206
Carnegie-Illinois Steel Corp.	168, 169
Carpenter Steel Co.	60, 61
Central Screw Co.	156
Century Electric Co.	167
Chandler Products Corp.	156
Chicago Drillet Corp.	204
Cincinnati Bickford Tool Co.	87
Cincinnati Electrical Tool Co.	240
Cincinnati Gear Co.	180
Cincinnati Grinders Incorporated	10, 11
Cincinnati Milling Machine Co.	4, 5
Cincinnati Planer Co.	64
Clearing Machine Corp.	189
Cleveland Crane & Engineering Co. Steelwald Machry. Div.	188
Cleveland Hobbing Machine Co.	133
Cleveland Tapping Machine Co.	222
Cleveland Twist Drill Co.	219
Columbia Steel Co.	168, 169
Columbia Tool Steel Co.	224
Cone Automatic Machine Co.	27
Consolidated Machine Tool Corp.	58
Continental Screw Co.	156
Continental Tool Works, Div. of Excello Corp.	83
Corbin Screw Corp.	156, 178
Coulter Machine Co., James	198
Crafts Co., Inc., Arthur A.	228
Criterion Machine Works	224
Danly Machine Specialties, Inc.	192
Davis Keyseater Co.	204
Davis & Thompson Co.	198, 222
Dayton Rogers Mfg. Co.	230
Dearborn Gage Co.	151
DeSanno & Son, Inc., A. P.	215
Desmond Stephan Mfg. Co.	224
Detroit Die Set Corp.	186
DeVlieg Machine Co.	33
Durez Plastics & Chemicals, Inc.	177
Eastern Machine Screw Corp.	236
Elmes Engineering Works of American Steel Foundries	187
Errington Mechanical Laboratory	228
Etna Machine Co.	196
Excello Corp.	28, 29
Executone, Inc.	238
Federal Telephone & Radio Corp.	223
Fellows Gear Shaper Co.	8, 9
Fitchburg Grinding Machine Corp.	34
Foote Bros. Gear & Machine Co.	185
Fosdick Machine Tool Co.	40
Fuller Brush Co.	240
Gallmeyer & Livingston Co.	210
Ganschow Gear Co.	184
Gear Specialties Mfrs.	180
General Electric Co.	69
General Machinery Corp. (Ohio)	68
General Screw Mfg. Co.	156
Geometric Tool Co.	184
Geroter May Corp.	176
Giddings & Lewis Machine Tool Co.	62, 63
Gisholt Machine Co.	30
Gleason Works	3
Goss & de Leeuw Machine Co.	194
Grant Gear Works	182
Grant Mfg. & Machine Co.	190
Gray Co., G. A.	43
Gray-Mills Co.	41
Gulf Oil Corp.	53
Hamilton Tool Co.	202
Hardinge Brothers, Inc.	67
Harper Co., H. M.	156
Harrison Radiator Div., General Motors Co.	163
Hartford Special Machinery Co.	182, 222
Heald Machine Co.	2nd Cover
Hecker, A. W.	213
Hedstrom Corp., Oscar W.	162
Henry & Wright Mfg. Co.	190
Hobart Brothers	236
Hoefer Mfg. Co.	239
Holman Reamer Co.	222
Hones, Inc., Charles A.	238
Hyatt Bearings Division, Gen. Motors Corp.	166
Illinois Gear & Machine Co.	183
Independent Pneumatic Tool Co.	26
Industrial Steels, Inc.	175
International Detrola Corp., Foster Div.	16
International Screw Co.	156
International Telephone & Telegraph Corp.	223
J. & S. Tool Co.	232
Johnson Machine Co., Carlyle	172
Jones & Lamson Machine Co.	6, 7
Jones & Laughlin Steel Corp.	72
Kearney & Trecker Corp.	31
Keller Tool Co.	242
Kelley Gear & Tool Co.	182
Kempsmith Machine Co.	36
Kennametal, Inc.	42
Kent-Owens Machine Co.	199
Kingsbury Machine Tool Co.	82
Knight Machinery Co., W. B.	210
Lake Erie Engineering Corp.	191
Lamson & Sessions Co.	156
Landis Machine Co.	14, 15
Landis Tool Co.	18, 19
Lavallee & Ide, Inc.	228
Leach Machinery Co., H.	239
LeBlond Machine Tool Co., R. K.	79
Leland Gifford Co.	192
LeMaire Tool & Mfg. Co.	200
Lempco Products Corp.	37
Lincoln Electric Co.	50, 51
Linley Brothers Co.	202
Lodge & Shipley Machine Tool Co.	131

ADVERTISERS INDEX

	Page
Logansport Machine Co., Inc.	174
Lord Manufacturing Co.	165
Lovejoy Tool Co., Inc.	229
Lowenstein, Alex	172
Lucas Machine Tool Co.	206
Luers, J. Milton	236
Lufkin Rule Company	148
Lynn Mfg. Co.	236
McCaskey Register Co.	158
McCrosky Tool Corp.	139
McGraw-Hill Book Co., Inc.	184, 242
Manheim Mfg. & Belting Co.	171
Manufacturers Screw Products	156
Master Rule Mfg. Co.	154
Meisel Press Mfg. Co.	182
Metro Tool & Gage Co.	45
Michigan Tool Co.	141
Micromatic Hone Corp.	38, 39
Midvale Co.	235
Mid-West Abrasive Co.	85
Milford Rivet & Machine Co.	156
Miller-Knuth Co.	224
Millholland Machinery Co., W. K.	198
Mitts & Merrill	206
Monarch Machine Tool Co.	24, 25
Moore Special Tool Co.	157
Morey Machinery Co.	192
Morris Machine Tool Co.	90
Morse Chain Co.	160
Morse Twist Drill Co.	231
National Machine Tool Co.	232
National Screw & Mfg. Co.	156
Newark Gear Cutting Machine Co.	184
New Britain-Gridley Machine Division, New Britain Machine Co.	3rd Cover
New England Screw Co.	156
Nicholson File Co.	217
Nicholson & Co., W. H.	226
Norton Company	22, 23, 66
Ohio Crankshaft Co.	159
Ohio Machine Tool Co.	76
Oliver Instrument Co.	190
Parker-Kalon Corp.	56, 156
Pawtucket Screw Co.	156
Pheoll Manufacturing Co.	156
Philadelphia Gear Works, Inc.	181
Phillips Screw Manufacturers	156
Portage Machinery Co.	206
Potter & Johnston Machine Co.	77
Pratt & Whitney Div., Niles-Bement-Pond Co.	59
Process Gear	184
Production Machine Co.	206
Pyroxylin Products, Inc.	240
Quaker City Gear Works, Inc.	180
Quality Tool & Die Co.	211
Randall & Stickney	228
Reading Screw Co.	156
Ready Tool Co.	226
Reed-Prentice Corp.	206
Reynolds Metal Co.	54, 55
Revere Copper & Brass, Inc.	143
Rieger Mfg. Co.	232
Rivett Lathe & Grinder, Inc.	78
Russell Burdsall & Ward Bolt & Nut Co.	156
Ruthman Machinery Co.	172
Ryerson & Sons, Inc., Joseph T.	152
Schatz Manufacturing Co.	161
Schauer Machine Co.	210
Scherr Co., Inc., George	80
Schneible Co., Claude B.	230
Scovill Manufacturing Co.	156
Seifert, Inc., E. R.	204
Shakeproof, Inc.	156
Sheffield Corp.	147
Sheldon Machine Co., Inc.	194
Shore Instrument & Mfg. Co.	234
Sier-Bath Gear Co., Inc.	179
Sigourney Tool Co.	210
Smith & Mills Co.	210
Snyder Tool & Engineering Co.	44
South Bend Lathe Works	84
Southington Hardware Mfg. Co.	156
Special Devices Co.	242
Specialty Products Co.	241
Springfield Machine Tool Co.	192
Standard Conveyor Co.	150
Standard Gage Co., Inc.	71
Standard Pressed Steel Co.	237
Steel Company of Canada Ltd.	156
Steelweld Mchry., Div. Cleveland Crane & Engineering Co.	188
Stuart Oil Co., Ltd., D. A.	236
Sundstrand Machine Tool Co.	221
Sun Oil Company	149
Super Tool Co.	227
Threadwell Tap & Die Co.	209
Timken Roller Bearing Co. (Steel & Tube Div.)	49, 4th Cover
Tool Improvements Co.	234
Torrington Co.	145, 190
Turner Gauge Grinding Co.	146
Union Twist Drill Co.	57
U. S. Drill Head Co.	242
United States Steel Corp.	168, 169
United States Steel Export Co.	168, 169
Universal Boring Machine Co.	210
Universal Engineering Co. (Calif.)	234
V & O Press Co.	204
Van Keuren Co.	47
Van Norman Co.	12, 13
Veeder-Root, Inc.	170
Vickers, Inc.	155
Victor Machinery Exchange, Inc.	220
Vinco Corporation	197
Wade Tool Co.	218
Walker Co., Inc., O. S.	226
Walker-Turner Co.	195
Waltham Machine Works	204
Waltham Screw Co.	162
Warner & Swasey Co.	88
Webber Gage Co.	126
Weldon Tool Co.	220
Westinghouse Electric & Mfg. Co.	65
Wheel Trueing Tool Co.	216
Wickman Corp.	225
Wilson Machine Products Co.	137
Wilson Mechanical Instrument Co.	226
Wolverine Bolt Co.	156
Zeh & Hahnemann Co.	190

Classified Advertising

SEARCHLIGHT SECTION

Classification	*Page*
BUSINESS OPPORTUNITIES	246
CONTRACT WORK SECTION	243
Bergen Machine & Tool Co., Inc.	243
Bridgewater Screw Products Co.	243
Eastern Tool & Mfg. Co.	243
Fasold & Son, Dudley	243
General Pattern Works	243
Greist Mfg. Co.	243
J & S. Tool Co.	243
Nilson Machine Co., A. M.	243
Specialty Machine Tool & Die Co.	243
Thomas & Skinner Steel Products Co.	243
EMPLOYMENT SERVICE	244
PATENT ATTORNEY	246
POSITIONS VACANT	244, 246
POSITIONS WANTED	246
REBUILDING SERVICE	244, 245, 249
Hill-Clarke Machy. Co.	249
Lucas & Son, Inc., J. L.	244
Simmons Machine Tool Corp.	245
SELLING OPPORTUNITIES	246
WANTED TO PURCHASE	246, 253
USED EQUIPMENT	246-253
Aaron Machinery Co.	248, 250, 253
American Sales Co.	253
Bath Co., Cyril	251
Browning Mfg. Co.	250
Brownell, Hazard	249
Brooks, B. D.	253
Cincinnati Machinery & Supply Co.	249
DeWitt Tool Co.	253
Dony Machinery Co., D. E.	251
Eastern Machinery Co.	248
Emerman Machinery Corp.	252
Falk Machinery Co.	247
Galbreath Machinery Co.	252
Graff Machinery Tool Co.	250
Hill-Clarke Machinery Co.	249
Hyman & Son, Joseph	252
Interstate Machinery Co., Inc.	251
Kings Co. Machinery Exchange	252
Krischer Metal Product Co.	253
Land & Co., L. J.	253
Lucas & Son, Inc., J. L.	244
McDonald Machinery Co.	253
Miles Machinery Co., Inc.	248
Morey Machinery Co., Inc.	252
O'Brien Machinery Co.	253
Osborne & Sexton Machinery Co.	252
Ott Machinery Sales, Inc.	249
Paul's Motor & Machy. Supply	250
Reynolds Machinery Co.	251
S & S Machinery Co.	250
Simmons Machine Tool Corp.	245
State Machinery Co., Inc.	253
Strong, Carlisle & Hammond Co.	249
Triplex Machine Tool Corp.	246
Universal Hydraulic Machinery Co.	253
Victor Machinery Co.	253
West Penn Machinery Co.	249
Wigglesworth Machinery Co.	252
Zeeve & Co., Alex.	251

Page
220
197
218
226
195
204
162
88
126
220
65
216
225
137
226
156
190

Page
246
243
243
243
243
243
243
243
243
243
243
243
244
246
244, 246
246
245, 249
249
244
245
246
246, 253
246-253
250, 253
253
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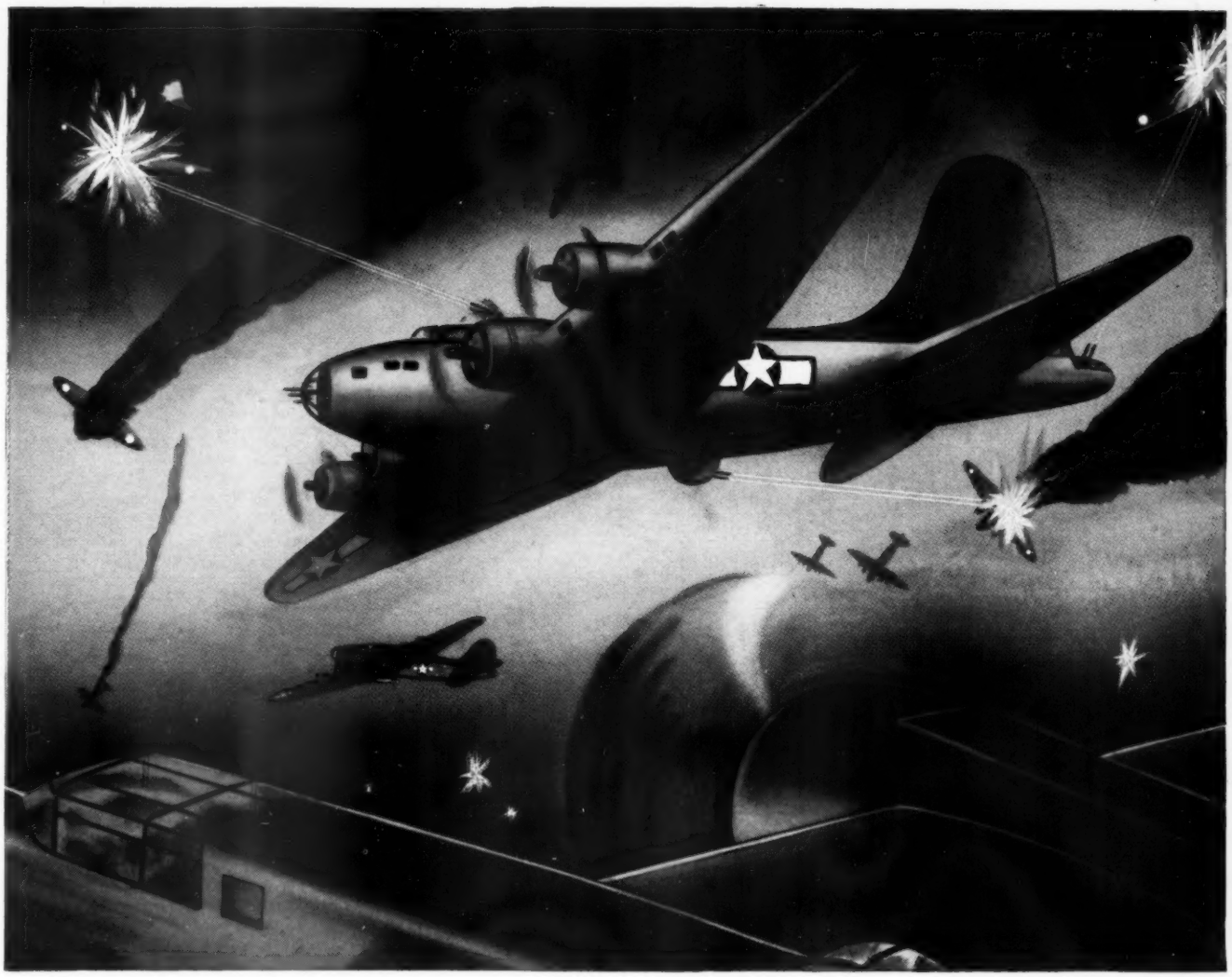
253
249
252
251



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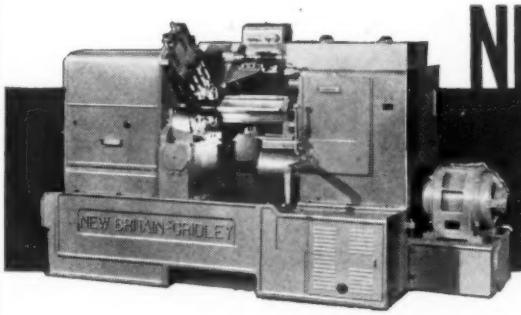

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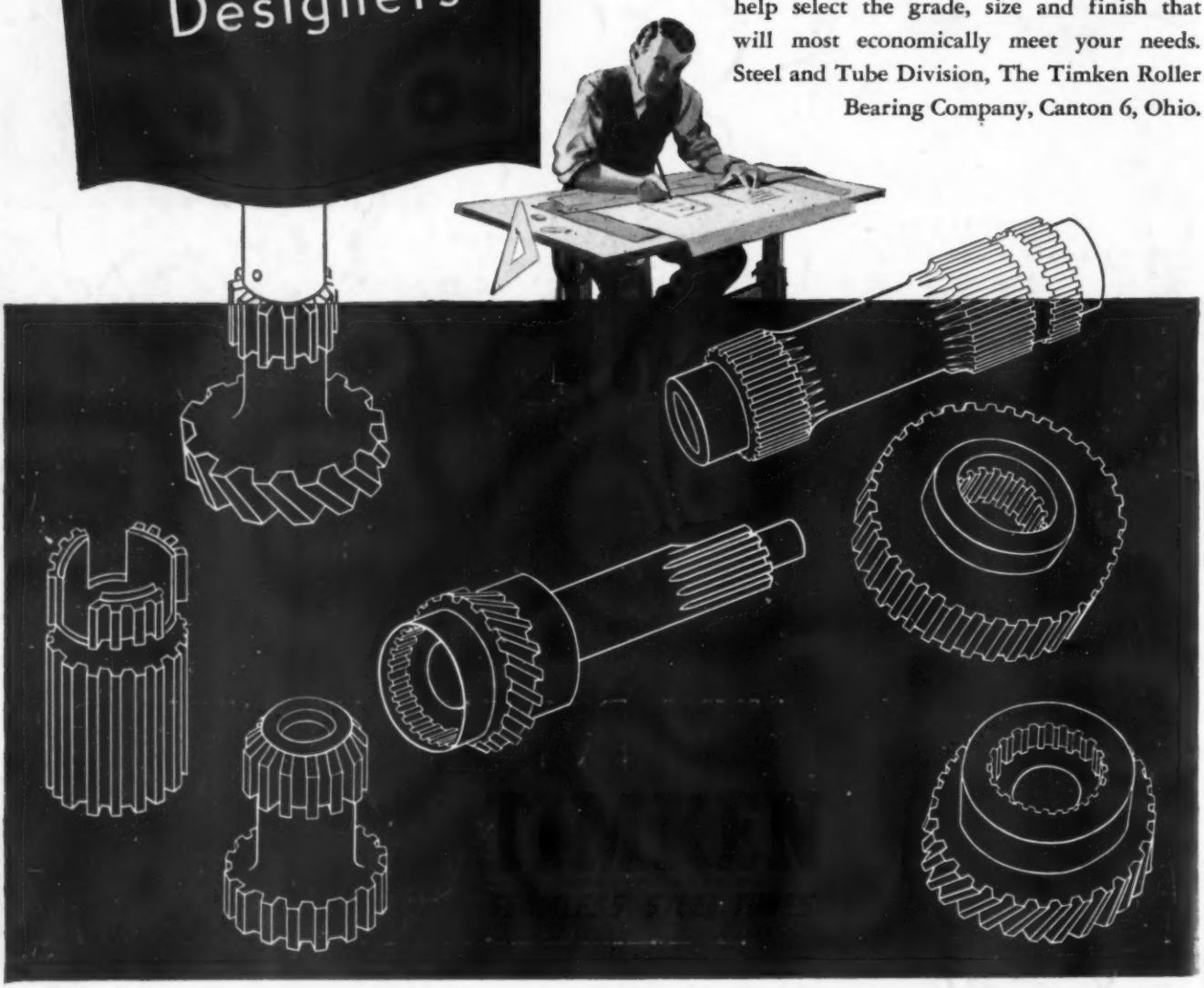

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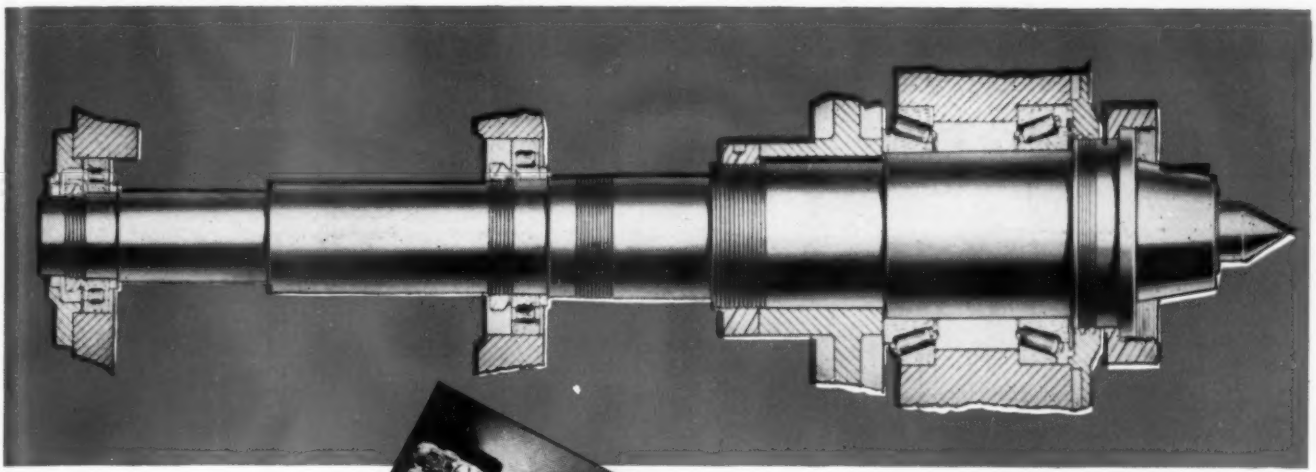

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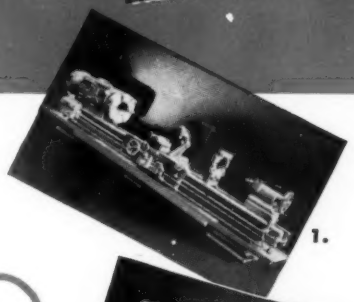
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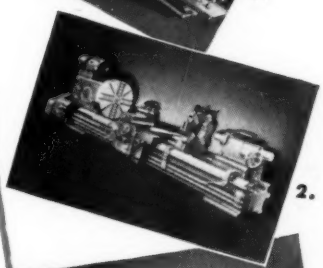
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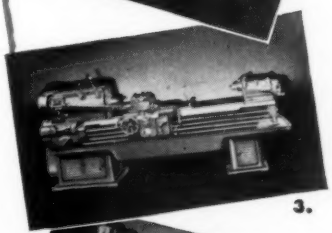
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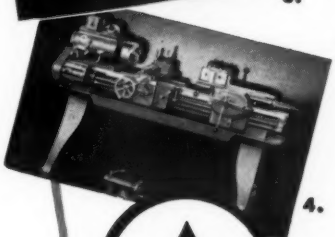
4.

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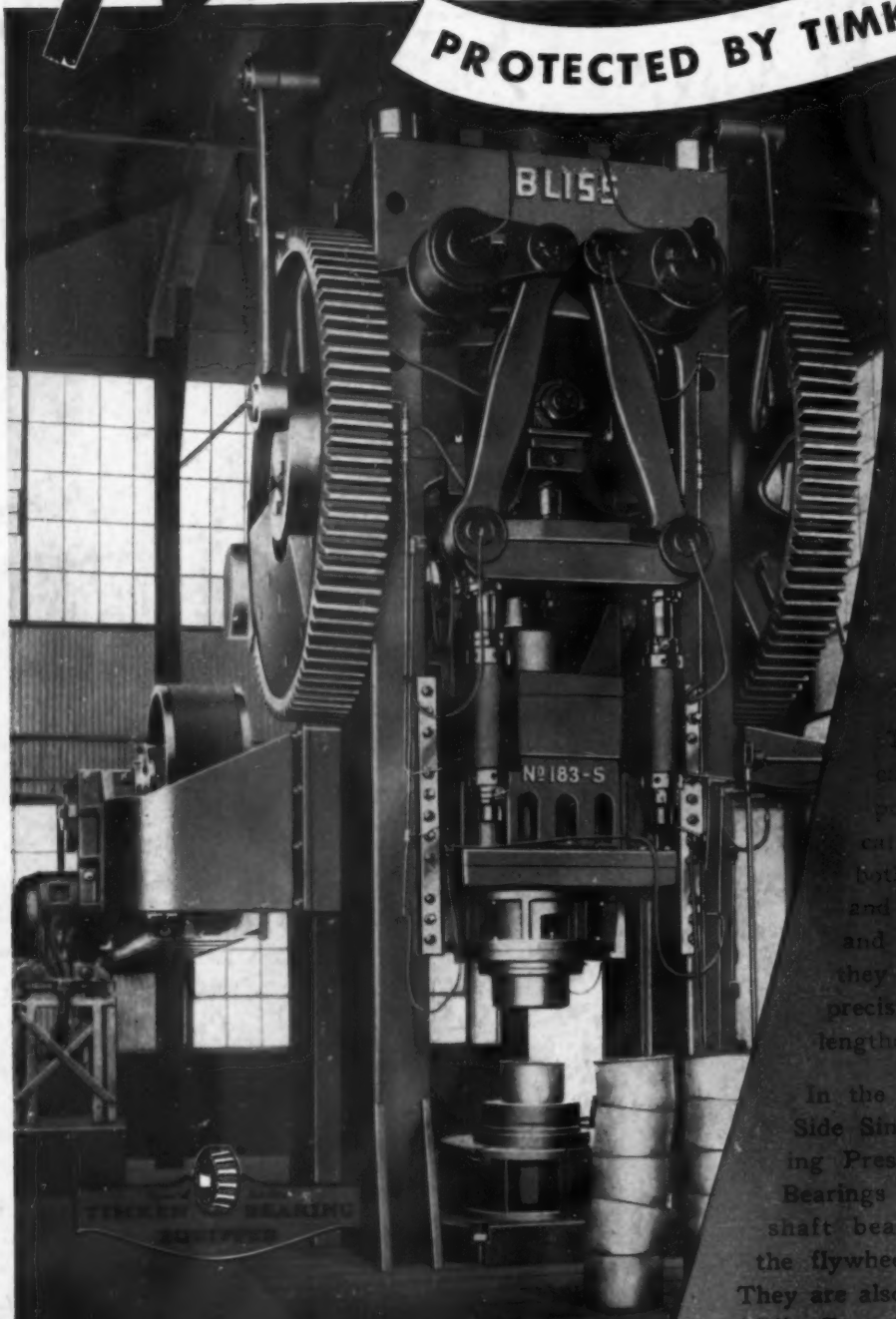

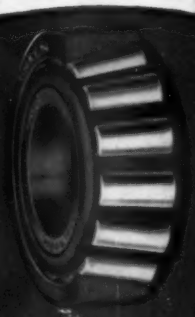

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They use Timken Bearings because, in addition to saving power, these bearings safely carry all loads—radial, thrust, or both together in any combination; and hold moving parts in correct and constant alignment. Thus they help to increase operating precision; add endurance; and lengthen machine life.

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